EM-7140-5

Resource Information Display System USER'S GUIDE

REVISED DRAFT

March 1979
Revised October 1979

Forest Service-USDA
Washington, D.C. 20013

Revised Draft

USER'S COMMENTS

Users are requested to submit comments, questions, and recommendations concerning the RIDS User's Guide. Direct this correspondence to the address listed on the facing page.

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Display
System

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Forest Service - USDA
Attn: Engineering Computer Systems
Operation & Maintenance Group
Box 2417
Washington, D.C. 20013

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INPUT FORMS *

* NOTE: A, G, H, I, J, K, P, R, S, T, V, W, Y, Z are the only input forms available in Demand Mode. All forms available in Batch.

SECTION A

USER GUIDE

I. GENERAL INFORMATION

A. <u>Identification System Name</u>: Resource Information Display, GRID (RID*GRID)

Location: FCCC

Language: FORTRAN

B. <u>Summary</u>

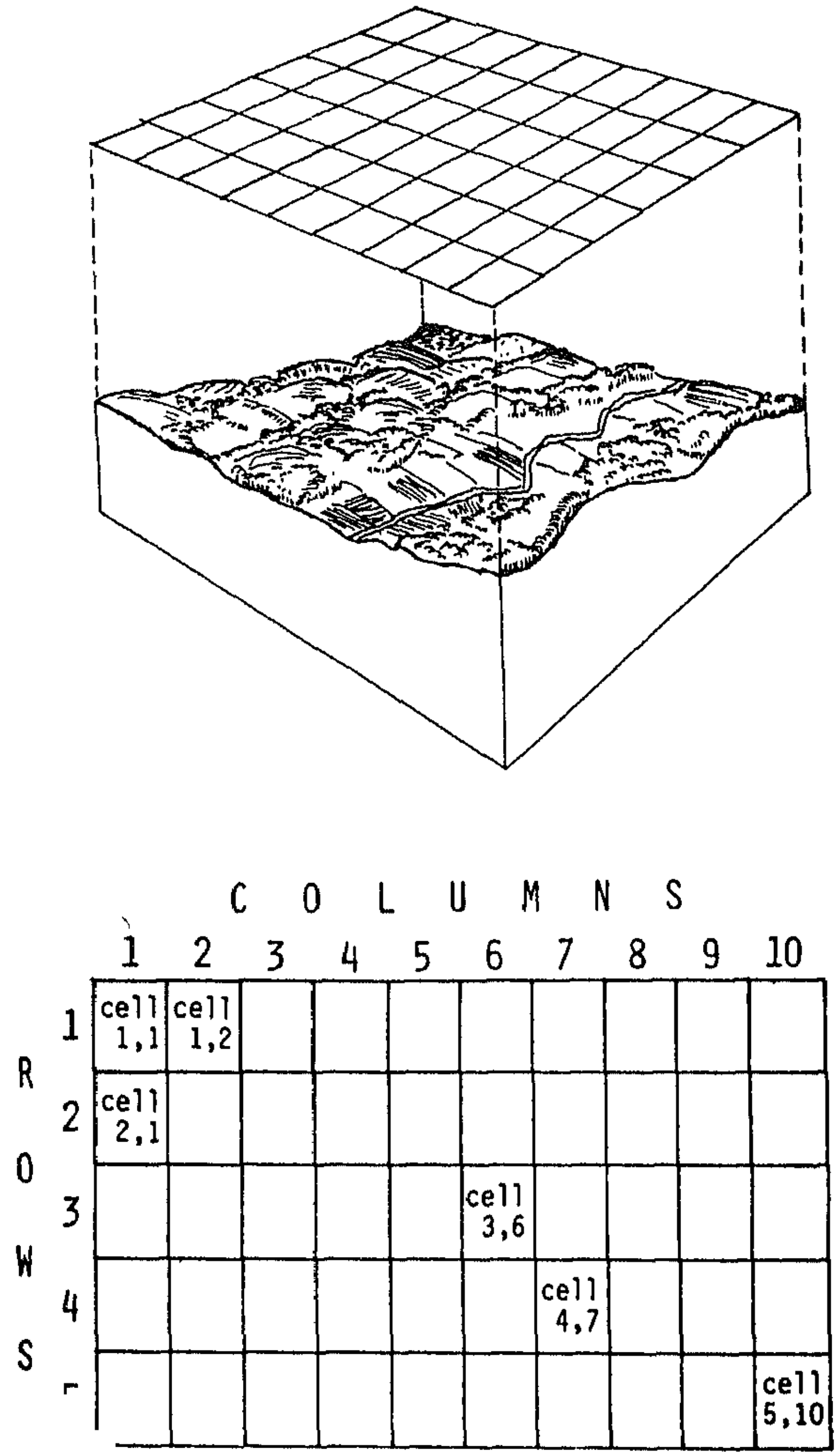
1. General

GRID is designed to provide an efficient means for storage and graphic display of large quantities of land use information collected on the basis of a grid made up of square or rectangular cells of a specified area. Cells are located by their row and column positions (See Exhibit A1).

GRID is also able to handle polygon digitized data that can be converted to a grid format using a preprocessor (See Section "C & D").

The data displayed by GRID can be used for:

- Identifying areas suitable and/or desirable for specific uses or management practices.
- Developing alternatives.
- Testing alternatives.
- Identifying areas where resource or use conflicts exist or have potential for occuring.



11.--Grid layout, row and column

2. Documentation

This documentation will cover development of the computerized data base, editing and maintaining the data base, generation of new variables in the data base, and obtaining the following graphic displays: (1) single display, (2) intersection, (3) linear combinations, (4) window display (see Exhibits A2 and A3).

3. Objectives

   a. Provide a computer tool for fast and efficient data manipulation and mapping.

   b. Provide system for preserving spatial information.

   c. Provide user instructions that can be understood by non-programmers and easily and efficiently applied by field units.

   d. Provide sufficient general documentation for Service-wide application.

   e. Provide graphic examples for easy interpretation of program features.

   f. Build user confidence in using a computer mapping system.

4. Goals

After reading this documentation users will be able to:

   a. Develop data bases.

   b. Edit and maintain existing data bases.

   c. Generate displays from data bases.

5. Assumptions

Users have access to a demand terminal for demand operation and facilities for batch mode operations.

GRID MAPPING SYSTEM

DETERMINE INPUT METHOD
- 7.5' Quad as one sector

DEFINE STUDY AREA
- Identify Study Area Boundary
- Determine cell size (Method I)
- Determine Grid Code and Sector Size

DATA FORMAT
- Topic and Values
- Clean Data

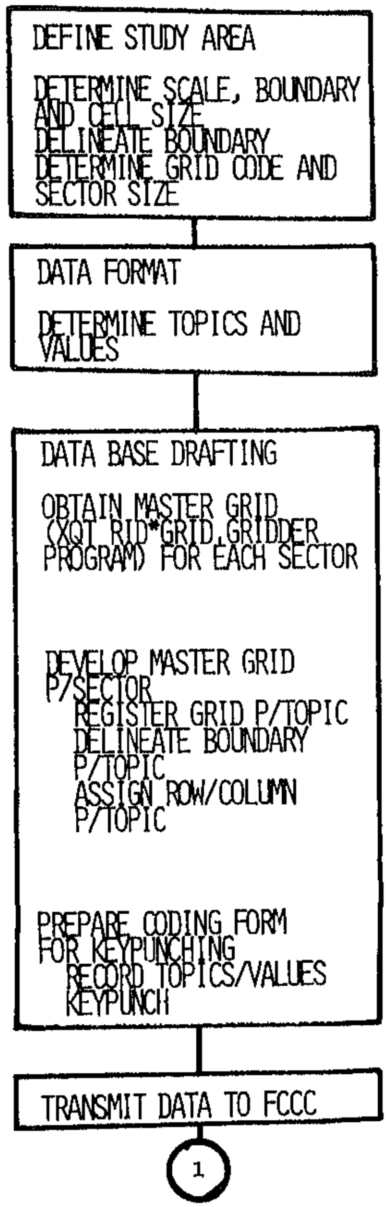
DATA BASE DRAFTING
- Supplies needed
- Procedures for obtaining supplies
- Development of Master Grid
- Coding Values
- Prepare Code sheet for Keypunching

INPUT FORMS
- Initial Run - Passive
- Verification Run - Passive
- Create initial File-Active
- Adding new topics

DATA MANIPULATION
- Single Character
- Gray Scale (numeric map only)
- Geographic Topic Outline
- Selective Area (window)

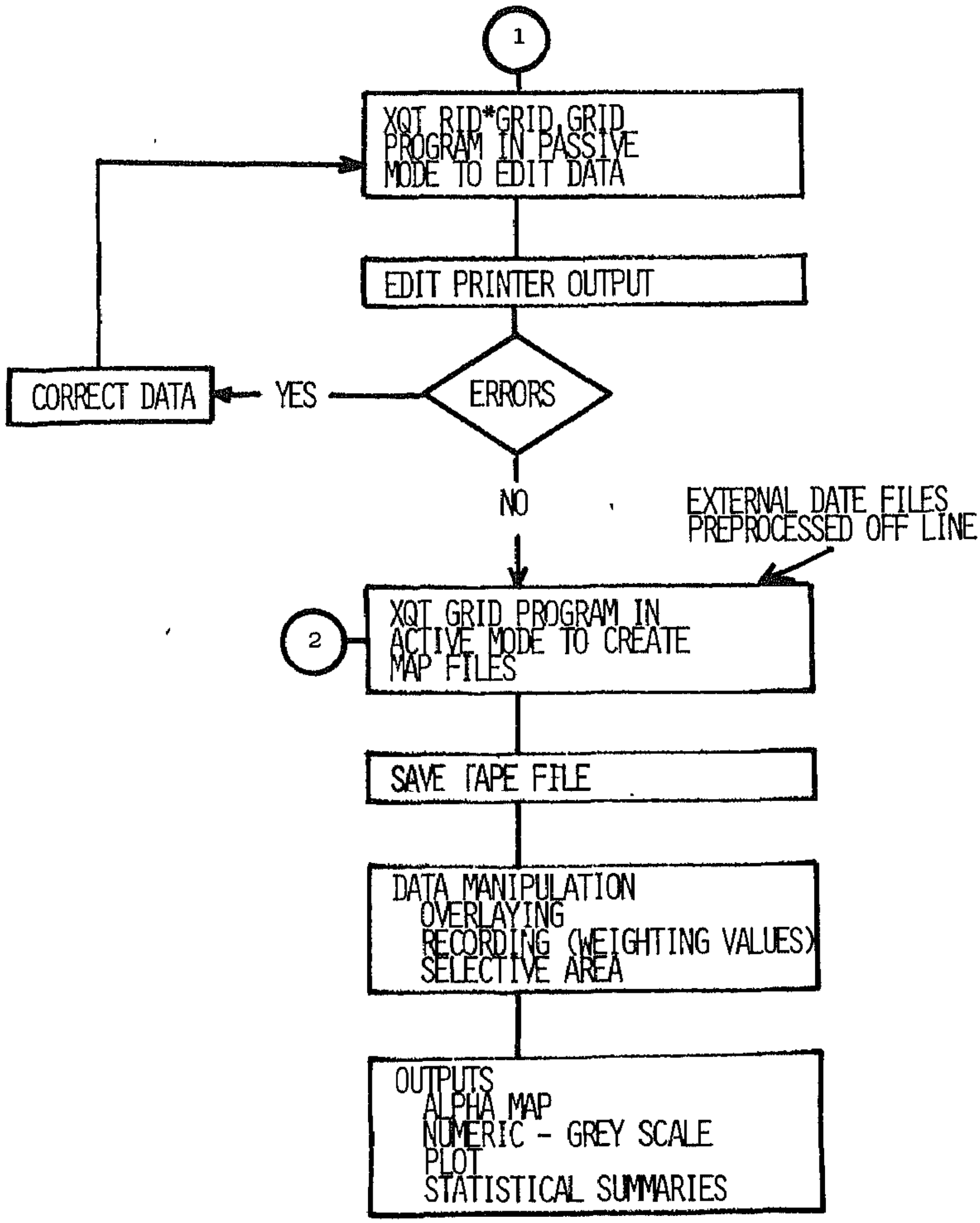
DATA MAPPING OPTIONS
- Single Topic
- Intersection
- Linear Combination
- Window

ibit A2.--Grid mapping system process (Part 1 of 4)



FLOW CHART FOR RUNNING GRID (1)

Exhibit A2.--Flow chart for running grid (Part 2 of 4)



A2.--Flow chart for running grid (Part 3 of 4)

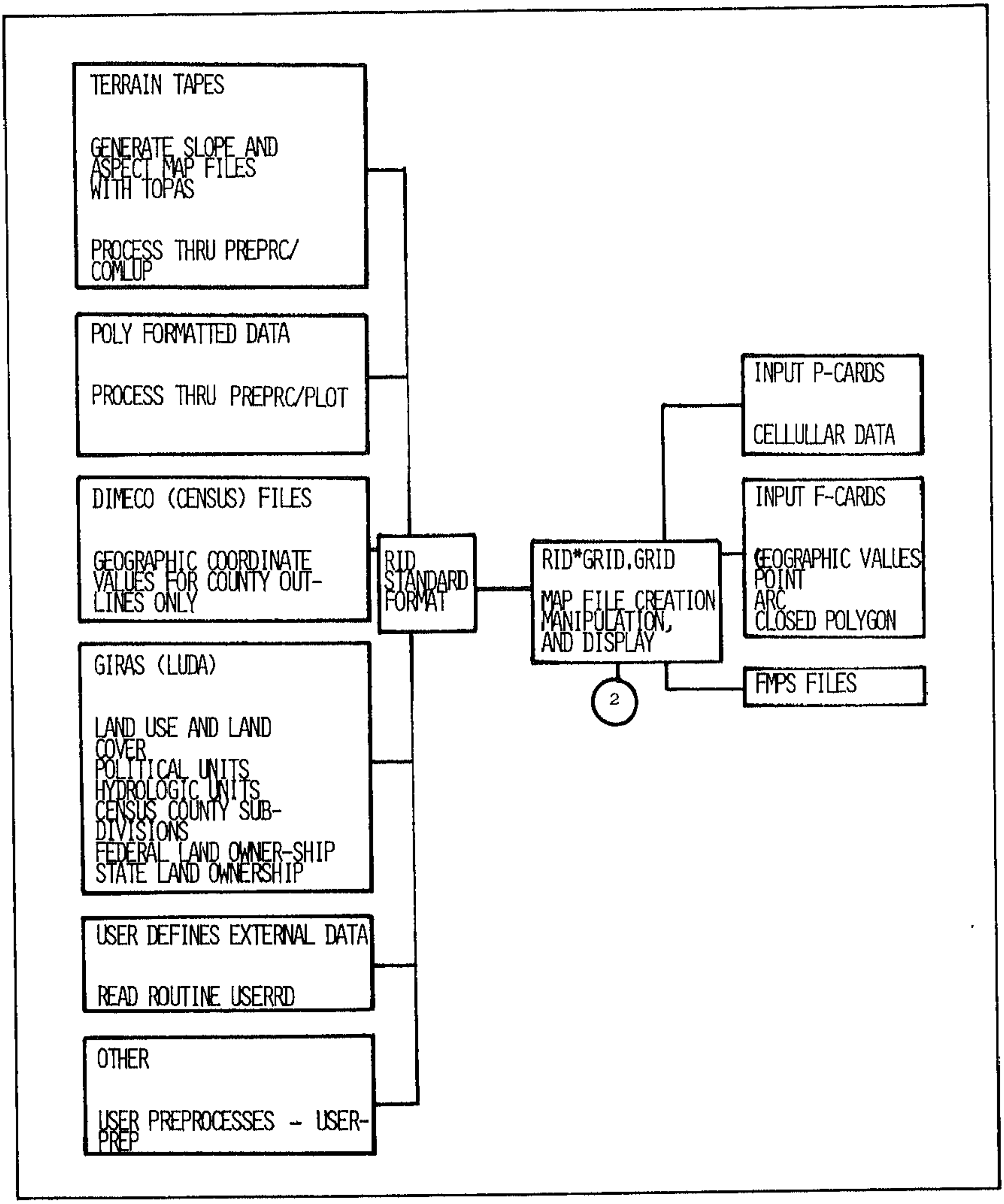


Exhibit A2.--Flow chart for running grid (Part 4 of 4)

GRID SYSTEM
DATA COLLECTION

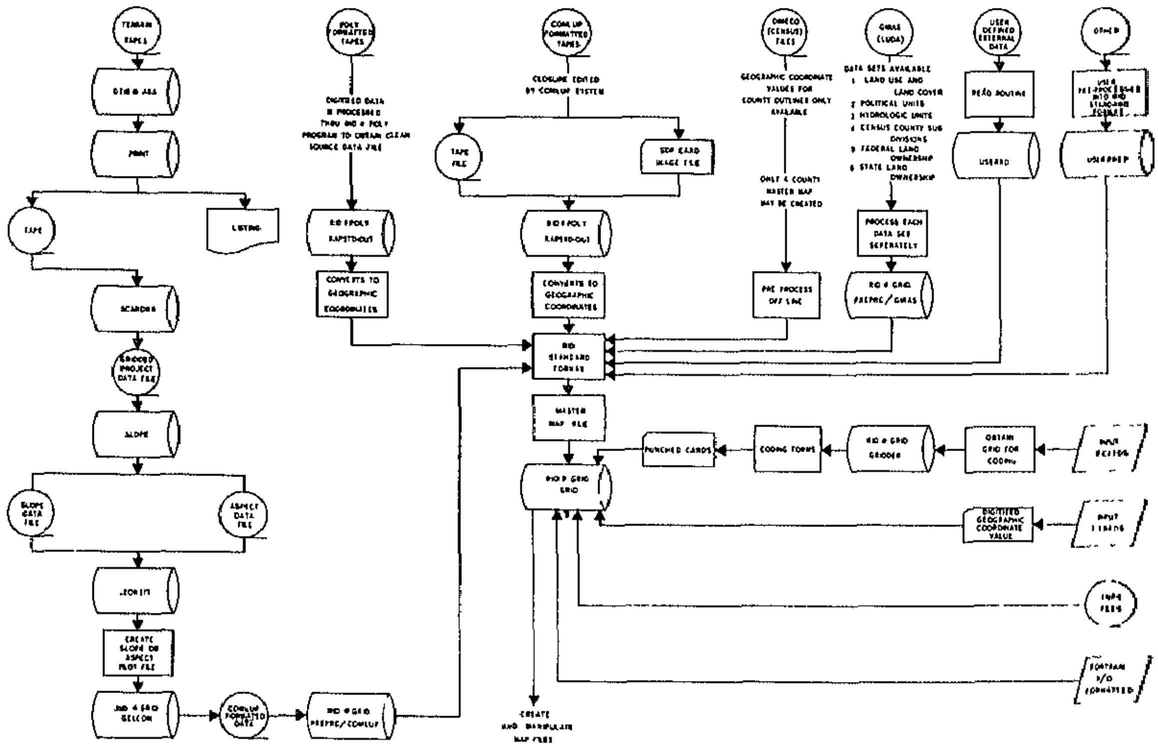


Exhibit A3.--Grid system flow chart
(Part 1 of 2)

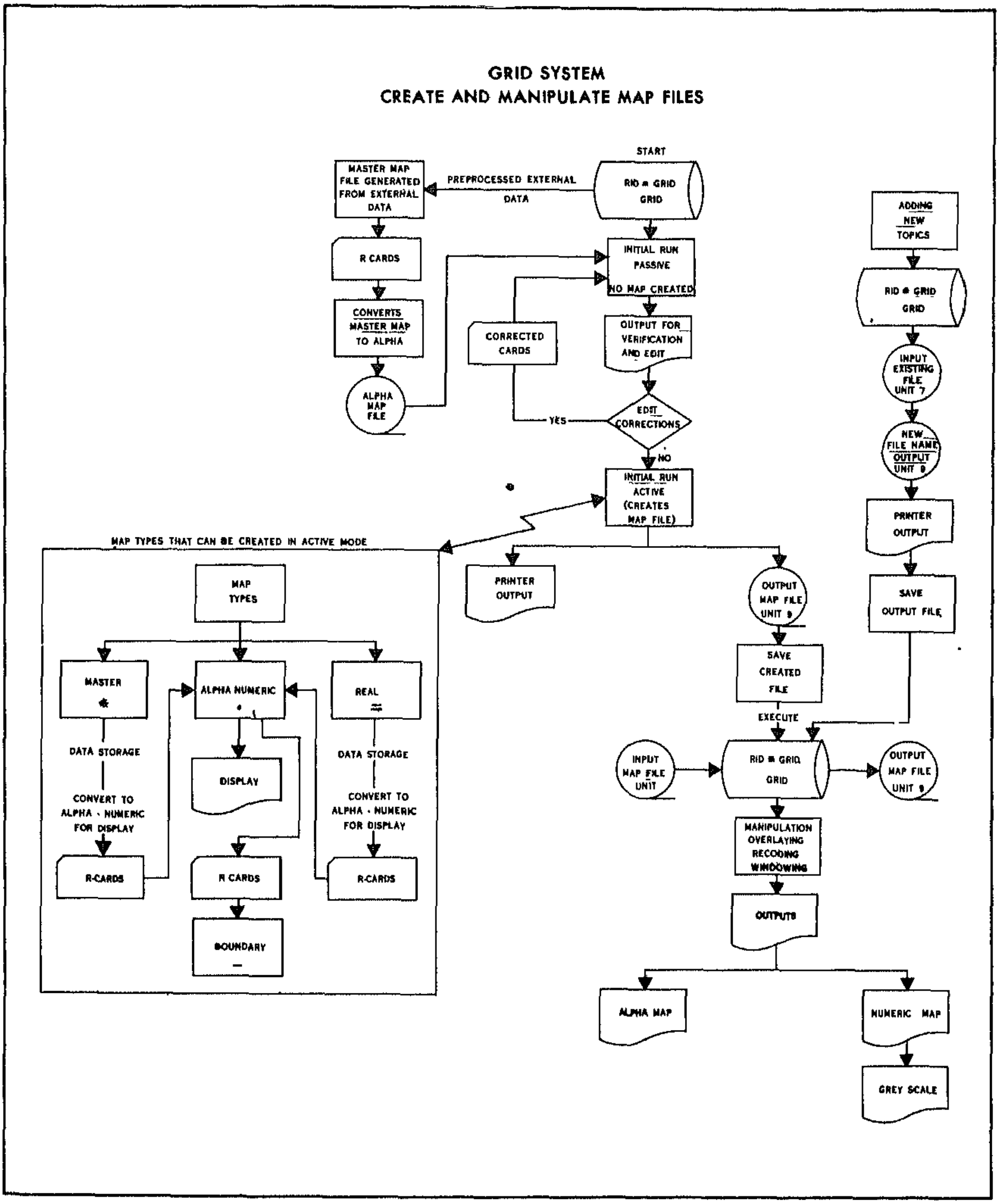


Exhibit A3.--Grid system flow chart (Part 2 of 2)

II. APPLICATION

A. Introduction

The program RID*GRID is a FORTRAN Program to store, retrieve, manipulate, and combine information that has an on-the-ground relationship. The program features:

-- An ability to display a single topic from combining layers of resource and physical data such as soils, topography, vegetation, etc.

-- A fully labeled line-printer map display with quantitativ output such as statistical area summaries and histograms.

-- A geographic base system of which the data base is keyed latitude and longitude map coordinates. This facilitates the registration and location of the output map.

-- Topic maps can be created using linear combinations.

Map generation can be generated and printed at the Forest computer terminal or generated and printed on the line print in the Regional Office. Turnaround time will depend on processing priority and mailing. As mentioned in the section or data base development, line printer characters occupy a rectangular area 1/10" wide by 1/8" high. The line printer has the capability to:

(1) Print six or eight lines per inch depending on the desi map scale (see Exhibit A9 under data base development).

(2) Overprint characters to obtain desired grey scale shade

(3) Produce statistical reports; user can suppress the map output and obtain statistical outputs only if requested.

(4) Slow speed terminals such as demand terminals are not suitable for large map display requests and are not always capable of producing overstrike characters to produce a grey output map.

GRID is a generalized system which is user-oriented and open-ended for future expansion. "User-oriented" refers to the ability to operate the system without the need for a programer, and "open-ended" refers to the structuring of the GRID logic such that additional features can be incorporated without extensive reprograming. For illustration purposes the following display mapping options will be discussed.

-- Single topic display

1) Cell data only without geographic boundary outline

2) Cell data with boundary printed solid

3) Cell data with boundary outline dropped out

4) Geographic boundary outline only

-- Intersection

1) Alpha output

-- Linear combination

1) Numeric output

2) Grey scale

-- Window display

1) With geographic boundary outline

2) Cell data only

-- Text Overlay

B. GRID Function and Characteristics

1. Introduction

The Resource Information Display System (RIDS) described here is an attempt to refine a portion of the data-handling needs of planners to facilitate further understanding of the factors contributing to environmental planning. It is hoped that through techniques such as this, significant progress can be made toward optimum problem solutions.

The relatively low cost of computer processing for this technique made it attractive to the Forest Service as a potential planning tool. During the past two years some additions have been introduced into the original program to simplify its use in Forest Service applications while retaining all its original capabilities.

2. Functions and Basic Features

The purpose of the system is to store, retrieve, manipulate, and combine planning area information. It was designed to meet S&PF, Area Planning and Development, needs related to cooperative studies. These studies encompass broad areas, sometimes involving several States, and include: river basin studies, multi-county and State land use planning, 208 planning as part of PL92-500, Wild

River Studies, and Coastal Zone Management.

'de its use in other Forest Service

The ways the system has been used to

date by the Forest Service include: combining layers of resource and physical data such as soils, topography, vegetation, etc., to determine land capabilities.

In addition the system will provide quantitative output such as statistical area summaries and histograms.

GRID is a geographic base system, that is, the data base is keyed to latitude and longitude map coordinates which facilitates the registration and location of the output map.

3. System Characteristics

Characteristics of the GRID system are similar to other cellular systems. There are, however, some unique characteristics that need to be highlighted.

The system has the capability for weighting cell information. In most cell systems a given cell is coded to reflect the predominant feature within the cell. To manipulate cell data with the GRID system it is possible to assign values to a cell to be multiplied, added, subtracted, divided, or used relationally with operators such as "equal to" (=), "less than" (<), and "greater than" (>). The weighted information can be printed to appear as shades of gray or a unique output character. Shading is accomplished by symbol selection and overprinting.

A system limitation is the number of levels (i.e. each timber type is a level, soil type is a level, etc.) that can be used for data output. The GRID system has 44

levels. This means that complex maps such as timber type would usually require more than one computer printout to display all levels.

The assignment of grid cells to specific levels may be accomplished in one of two ways; (1) for map layers with descriptive codes, (Timber, Ecological Land Types, Political) the user may specify which codes are to be associated with what level. (2) For map layers representing quantitative data, (SLOPE 0-10%), the user may specify the ranges of values to be asigned to the various levels; the GRID program will then compute the proper level for each grid cell. Input selection criteria is specified by the user. Consequently, this system afford greater flexibility for characterization of land inventory than other grid mapping systems.

Combination of multiple map layers (area intersections) in this system is a one-step operation. A maximum of ten (10) layers may be combined at one time.

There are two options for output maps. (1) Numeric maps can be displayed in shades of gray or single character output at 6 or 8 lines per inch on output printer, (2) other maps are displayed with single character map output.

following features are also available in the RID System and are discussed in APPENDIX "A" of the RID User's Guide obtaining Multivariate Histograms, Multivariate Frequency, Multiple Linear Regressions and Stepwise Regression. The system will also enable planners to perform optimization or simulation analysis and to produce maps and data graphics of the solution in various alphanumeric formats. A mathematical programing model is used for spatial optimization analysis.

C. Operating Procedures

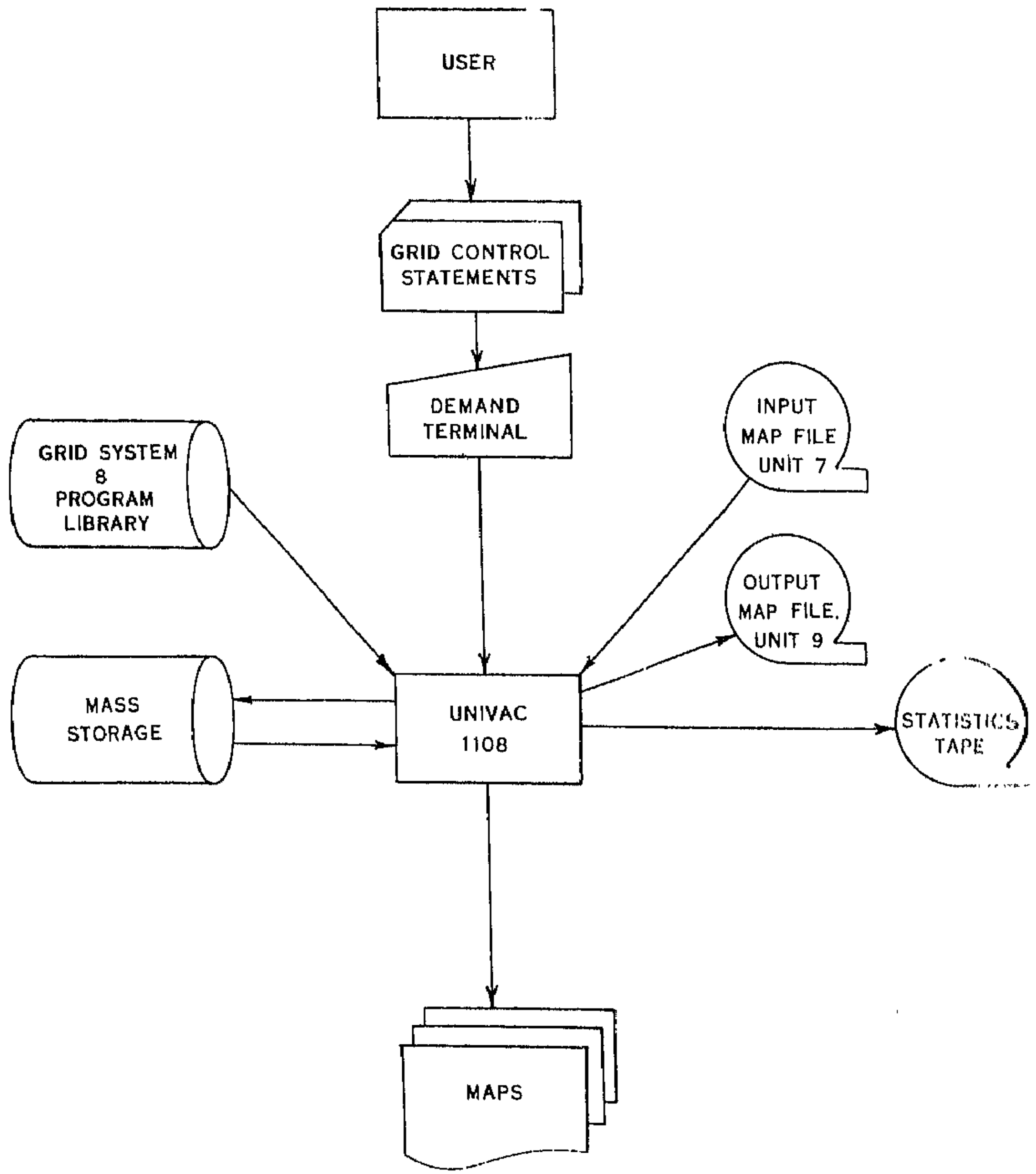
The GRID Program executes under the Univac Exec-8 operating system at FCCC. GRID requires certain standard control cards to be present both before and after the actual GRID request desk to communicate with the Exec-8 system.

This section provides for run set-up procedures and describes the required control cards.

It should be noted that the information in this manual is intended for use by persons who have a fundamental knowledge of the operational requirements of the Univac 1100 Exec-8 system.

1. Run Control

Exhibit A4 is a macro flow chart which shows the input/output characteristics of GRID for Demand Operation and for Batch Mode Operations.



d mode of grid system flow
rt 1 of 2)

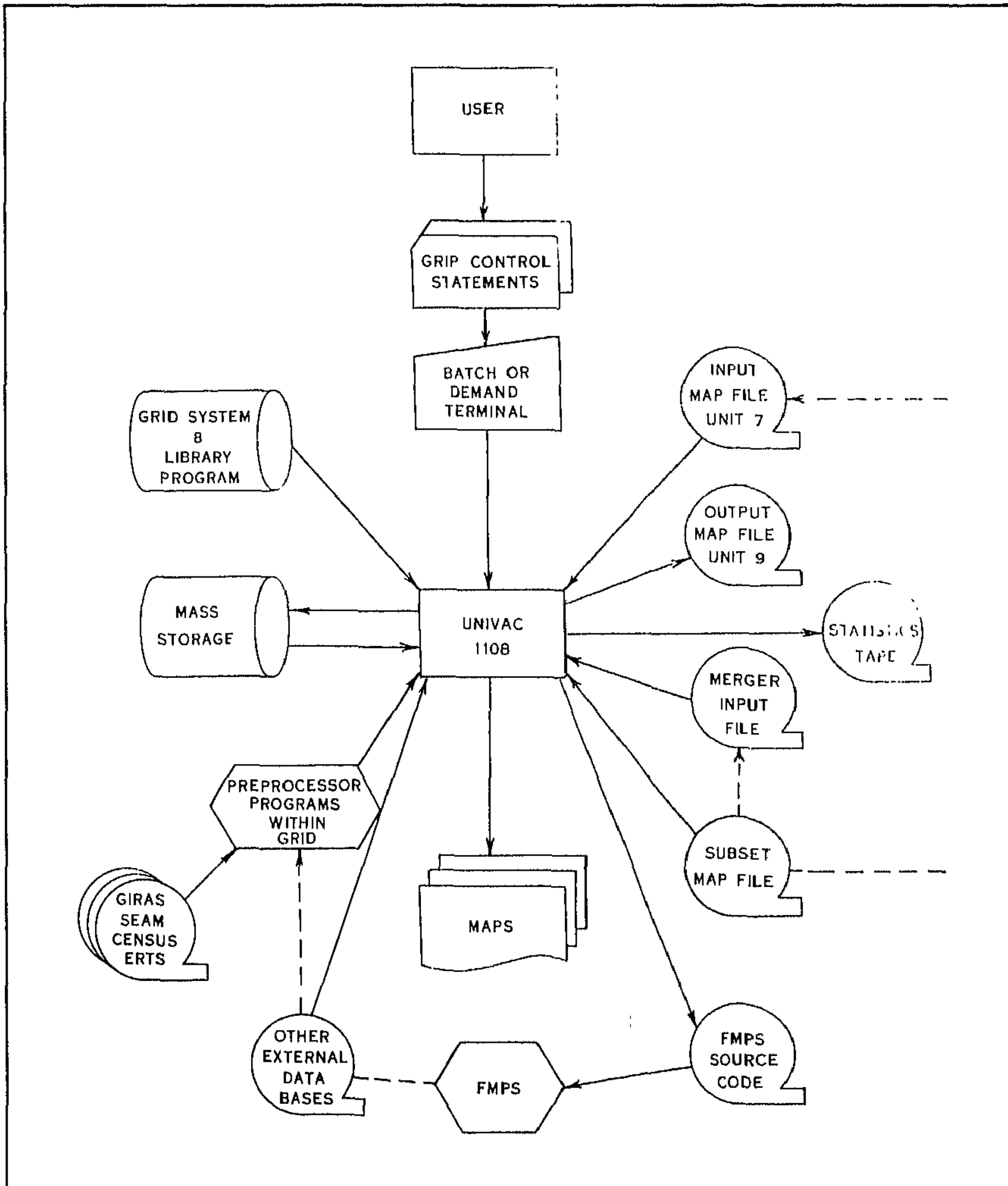


Exhibit A4.--Batch mode of grid system flow (Part 2 of 2)

Executions of GRID may be classified as either active or passive. Active Participation (runs) implements some change on the GRID System Map File and requires an output tape to be assigned. Passive Participation (runs) indicates that the Map File is not physically affected, only <u>monitored</u>.

For a systematical construction of the Map File there should always exist a data tape for backup to protect against a hardware or software error. For example, a suggested Input/Output Cycle (see below) could be as follows: Run #1 creates the initial output map file on Unit 9. Run #2 takes this output file from Run #1 as input on Unit 7. Then the output of Run #2 is used as input for Run #3. Note that the Input File of Run #2 is saved as the backup map file. Thus, there will be two reels of tapes used for every active GRID run, an input map file used for tape Unit 7, an output map file used for tape Unit 9, and one reel as backup from the previous run.

RUN NUMBER	INPUT MAP FILE Unit 7	OUTPUT MAP FILE Unit 9	BACKUP MAP FILE
1	--	TAPE 1	--
2	TAPE 1	TAPE 2	--
3	TAPE 2	TAPE 3	TAPE 1

Approximately 2700 Alpha Maps * or 900 master maps ** can be stored on a standard reel of computer magnetic tape

* Alpha Maps are used to describe a geographic area in terms of single characteristics. P/cell, i.e., soil type A.

** Master Maps are alpha maps used to describe a geographical area in terms of three characteristics P/cell, i.e., A13; A = Soil Type, 1 = Slope, 3 = Ranger District. The characters 1 and 3 must be added using "R cards." See APPENDIX "A" for additional information.

(2000, if the tape is 1600 bpi). If we assume that the <u>average study area</u> contains 12 sectors, then approximately 225 alpha or 83 master maps could be stored for all sectors within this area on one reel of tape.

2. Prototype Exec-8 Assignments

```
@ASG,A    RID*GRID    RIDS  program file

@ASG,T    7.,U9V,File Name,Tape Number  Input map-file

@ASG,T    9,U9V,File Name  Output map-file
                           (for "ACTIVE" runs)
```

Any of the above files (Input/Output Cycle) may alternatively be assigned to catalogued files on mass storage, with @USE name relationships established. Internal file names are indicated or the appropriate GRID control cards; they are all single charact names.

In compliance with installation operations policy, it may be necessary to precede output tape assignments with a write-ring message:

@MSG RING IN reel#

. Demand Mode Operation

GRID may be executed in either DEMAND or BATCH mode. Each has its advantages. For example, BATCH runs are far less expensive; but in DEMAND mode, the user has the advantages of immediate feedback and recovery from errors which would inhibit a BATCH run from executing As a result of the file size restriction (50K) imposed by FCCC in March 1978, for demand runs, a modified version of the standard GRI program was prepared for demand use only. The program is called RID*GRID.DGRID. The following data manipulation options are availa in a demand mode of operation; single topic display, intersection w alpha outputs, linear combinations with numeric output and gray sca window display of selected areas. Statistics are also displayed wi the above options.

See Appendix "A" for a complete description of these mapping options.

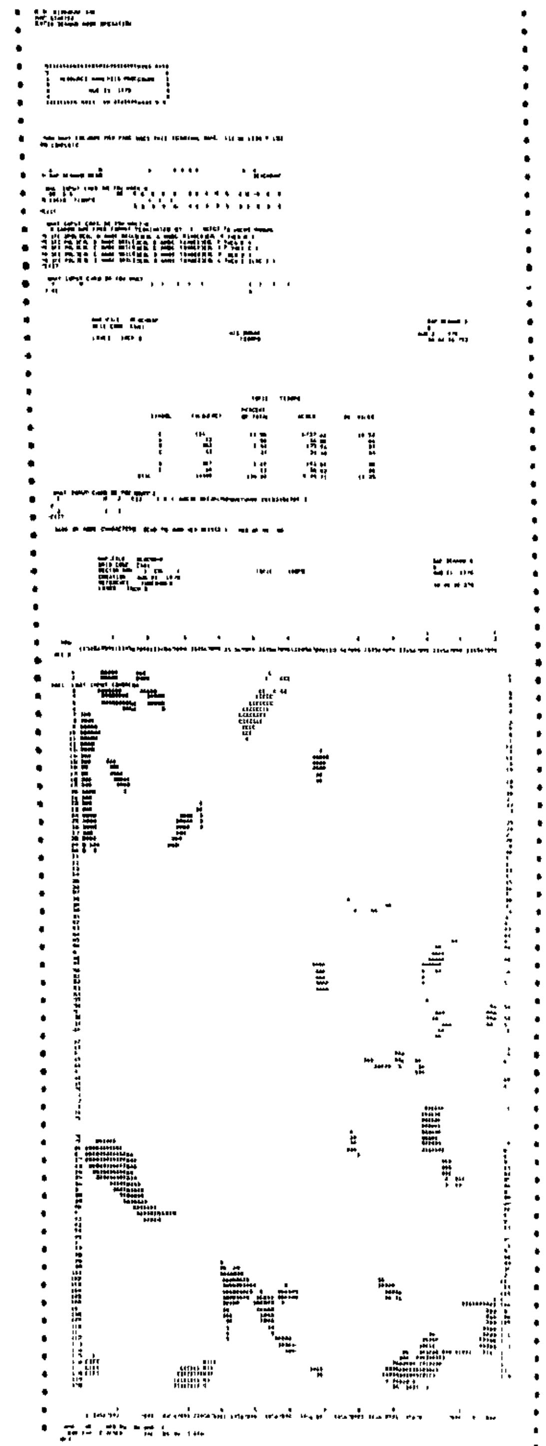
1. Demand Mode Input Procedure (DMIP)

   The input procedure performs several functions: To prompt the user for the next control card, to display control card patterns and column enumerations to allow recovery in case of detected errors. (See Exhibit A5.)

2. Input/Output Aids

   After the user, in response to the prompt, has entered his control card character, e.g., ('G' for G-card, etc.), DMIP displays a pattern which marks off the fields of that control card. This is to facilitate the entrance of data. Most of GRID's control cards are fixed-field format and column positioning is critical. In addition to the pattern, the user may at any time request a column enumeration by typing the command; SCALE.

   Many of GRID's control cards can appear in multiples--G, H, I, J, P, R, S, Z. After the user has typed several of a given card, the pattern may be quite remote with respect to his current line. If the user desires another pattern, he may type the command, PATTERNbn, where n is the control card letter.



A5.--Sample run (demand) intersection display

3. Terminating a Series of Statements

When the user has finished entering a series of (multiple) images, he types the command, EXIT, which causes his statement to be executed. He then receives another prompt from the DMIP.

In DEMAND mode, DGRID immediately analyzes all control cards (in BATCH, some analysis is deferred until the processing phase). If errors are detected, the system issues diagnostics and the statement just entered is voided. If errors are found on card which can appear only as singletons--A, K, T, V, W, Y, $--the user is returned to the top level of the DMIP which prompts him for another card. Singleton statements without errors are interpreted and executed as they are entered.

If the user hits a line-delete character (usually CTRL-X), his next input line will be offset from his pattern and/or scale. DMIP scans each line entered for its own line delete, '?'. If it discovers a '?' then the line is ignored, but a prompt character will appear at the terminal thereby preserving alinement.

The following feature applies to R-card only. Should the user decide to cancel a whole sequence of the same type card he may type, ABORT, which cancels the transaction and returns him to the top level of the DMIP.

4. Considerations for Demand Users

Since demand processing time is billed at a higher rate than BATCH, it would be prudent not to execute large time-consuming tasks in GRID from a terminal.

Since a considerable volume of output would be produced i[f] an entire map is displayed, the demand user is advised tc use the windowing card (W-card) to examine his maps at th[e] terminal. The user also has the opportunity to redirect his printed output to an alternate device (via @SYM PRINT$,, device). DGRID will query the user about redirection of output if he asks to display more than one sector.

Occasionally the user may wish to "@ADD" previously created files or elements into his GRID runstream. Normally, images entered at the terminal by an @ADD statement would not be echoed, but since errors may exis[t] in the @ADD'ed text, it may sometimes be desirable to ha[ve] the statements printed. The user may cause statements t[o] be echoed by typing, ECHO~~bb~~ON, and terminate it with ECHO~~bb~~OFF.

. PROCEDURES

A. Data File Development

The following outline provides instructions for preparation

data to be processed by the GRID program. The use of a USGS 7.5 minute quadrangle sheet, scale 1:24,000 is used throughout this example. This does not mean to imply that other scales cannot be used.

1. Introduction to Method I

   Method I is used if a 1:1 input relationship between a given map sheet and one sector is desired, i.e., one 7.5 minute USGS quadrangle sheet to represent one sector.

— — — — Portion of page deleted

METHOD I

Input by 7.5 minute quad using one sector.

This is the most accurate method of preparing your data base for coding, manipulation and output. The features of this method are: (See page 26)

-- Accurate statistics

-- Geographic referenced output

-- Data manipulation of adjoining sheets

-- No reference card needed

-- Compute sector row/column only for input

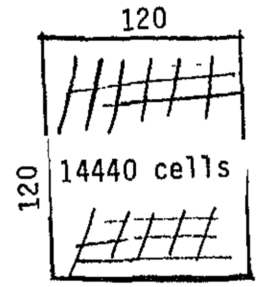
-- Output of adjoining sheets at one time

-- Output not at 1:1

-- Quad sheet divided into 120 rows by 120 columns

-- Each cell approximately 2.5 acres @ 1:24,000

-- A separate coding grid is constructed for each quad sheet



TYPICAL SECTOR/QU

1:1 RELATION

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3. Define the Study Area

   a. Identify Study Area Boundary

(Continued on page A-27)

METHOD I

(1) Decide on map scale to be used throughout data collection and study area boundaries. Boundaries ma coincide with previously established boundaries, e.g., unit planning boundary, wilderness boundary, or Forest boundary.

(2) Delineate boundary on map of same scale to be used throughout data collection. This may be a USGS quad sheet at 1" = 2000' or a reduced Forest map at 2" = 1 mile, etc.

(3) Identify geographic coordinates, latitude and longitude values of study area limits or sheet corners.

b. Determination of Cell Size.

METHOD I

The cell size for input using Method I is determined by a program--RID*GRID.GRIDDER (See Paragraph 6, Page 61). When the geographic corner values of your quad sheet are input, a plot tape will be created that will produce a grid 120 rows by 120 columns for the entire quad sheet.

For example, a 1:24,000 scale map the grid cell size will represent approximately 2.5 acres.

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c. Determine Grid Code and Sector Size

When large study areas consist of many quad sheets it becomes necessary to divide the area either by quads (METHOD I)

Each map sector has an associated geographic reference. This geographic reference or sector identification is used for identifying adjacent map sectors when maps requiring portions of two or more sectors are requested.

Once the study area and the associated sectors have been defined, each sector is mapped with GRID on a grid which is 120 columns wide and 120 rows high. An element of a map corresponds to one grid position within the sector. Since a sector is comprised of 120 rows and 120 columns, there are 14,400 elements per sector. The number of elements within a sector remains constant regardless of the mapping scale selected.

All map sectors are relative to a base latitude and longitude--that being latitude 53 N and longitude 128 W. With this origin the entire contiguous United States can be mapped. However, this base can be altered to suit the needs of the user (See Paragraph (2) and (4) of this section). The reference point is used in creating maps from digitized data sector rows and columns are computed according to the reference coordinates and the grid code. Maps participating in a composition must have been create relative to the same reference.

1) Sector Grid System -- Description

Maps produced by GRID are composed of areas called map sectors. The size of each sector is the product of the grid code level and the base sector size. The base sector has a default size of 3.75 by 3.75 minutes of arc. Thus, if the grid code level is given as 2, then the sector size is 7.50 by 7.50 minutes of arc (see Exhibit A9). Each sector is referenced by sector row and sector column numbers. Rows are numbered from top to bottom and columns are numbered from left to right (see Exhibit A6). For the GRID system the northern edge of the sector grid system is at 53 degrees north latitude; the western edge is at 128 degrees west longitude. Exhibits A7 and A8 illustrate the sector grid numbering convention for grid codes of 1 and 2 respectively. The southernmost sector row that can be referenced is 999; likewise, the easternmost column is 999.

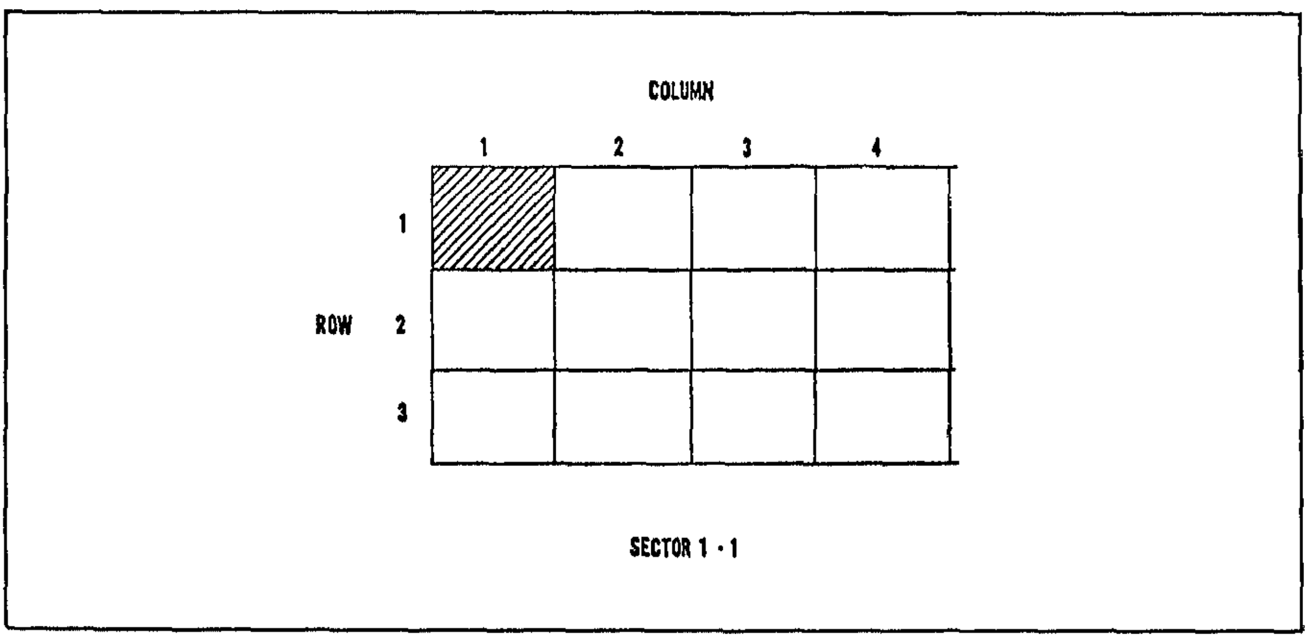


Exhibit A6.--Sector grid system

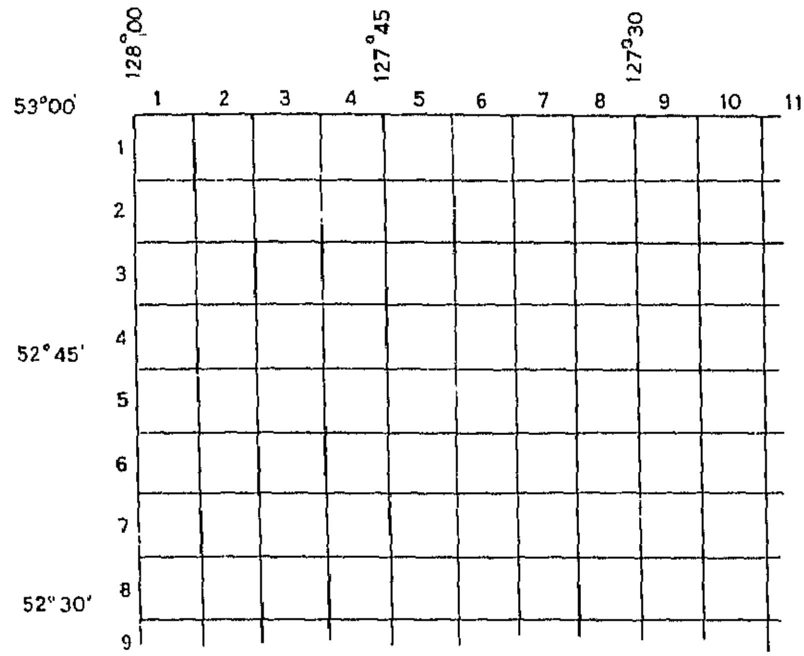
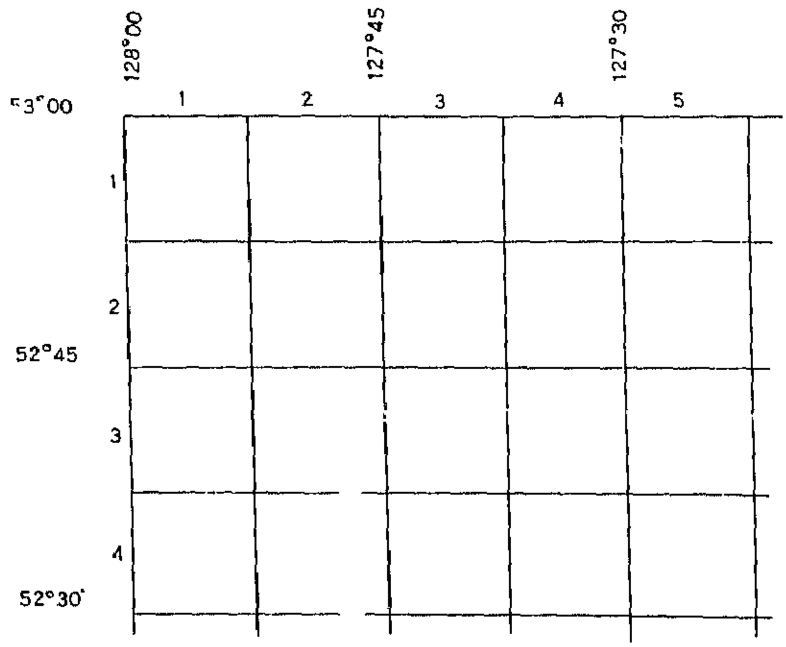


Exhibit 7.--Grid code level-1 (sector size 3.75 x 3.75)



bit A8.--Grid code level-2 (sector size 7.50 x 7.50

Grid Code Level	Sector Size	Default Base Sector
001	(1/16 Deg)	3.75 Min.
002	(1/8 Deg)	7.50 Min.
003		11.25 Min.
004	(1/4 Deg)	15.00 Min.
005		18.75 Min.
006		22.50 Min.
008	(1/2 Deg)	30.00 Min.
010		37.50 Min.
012		45.00 Min.
015		56.25 Min.
016	1 Deg	0.00 Min.
018	1 Deg	7.50 Min.
020	1 Deg	15.00 Min.
024	1 Deg	30.00 Min.
025	1 Deg	33.75 Min.
030	1 Deg	52.50 Min.
032	2 Deg	0.00 Min.
036	2 Deg	15.00 Min.
040	2 Deg	30.00 Min.
045	2 Deg	48.75 Min.
048	3 Deg	0.00 Min.
050	3 Deg	7.50 Min.
054	3 Deg	22.50 Min.
060	3 Deg	45.00 Min.
064	4 Deg	0.00 Min.
072	4 Deg	30.00 Min.
075	4 Deg	41.25 Min.

Exhibit A9.--Grid codes and corresponding sector sizes for line printer output 6 or 8 lines per inch

Grid Code Level	Sector Size	Default Base Sector
080	5 Deg	0.00 Min.
081	5 Deg	3.75 Min.
090	5 Deg	37.50 Min.
096	6 Deg	0.00 Min.
100	6 Deg	15.00 Min.
108	6 Deg	45.00 Min.
120	7 Deg	30.00 Min.
125	7 Deg	48.75 Min.
128	8 Deg	0.00 Min.
135	8 Deg	26.25 Min.
144	9 Deg	0.00 Min.
150	9 Deg	22.50 Min.
160	10 Deg	0.00 Min.
162	10 Deg	7.50 Min.
180	11 Deg	15.00 Min.
192	12 Deg	0.00 Min.
200	12 Deg	30.00 Min.
216	13 Deg	30.00 Min.
222	13 Deg	52.5 Min.
240	15 Deg	0.00 Min.
480	30 Deg	0.00 Min.

Exhibit A9.--Grid codes and corresponding sector sizes for Z printer output 6 or 8 lines per inch (continued)

2) Sector Size

METHOD I

The sector size is identical to the quad size that is being used to code the data. That is, a quadrangle is evenly divided into 120 rows by 120 columns to form a single sector covering the entire quad.

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SECTOR SIZE CHANGE ILLUSTRATED

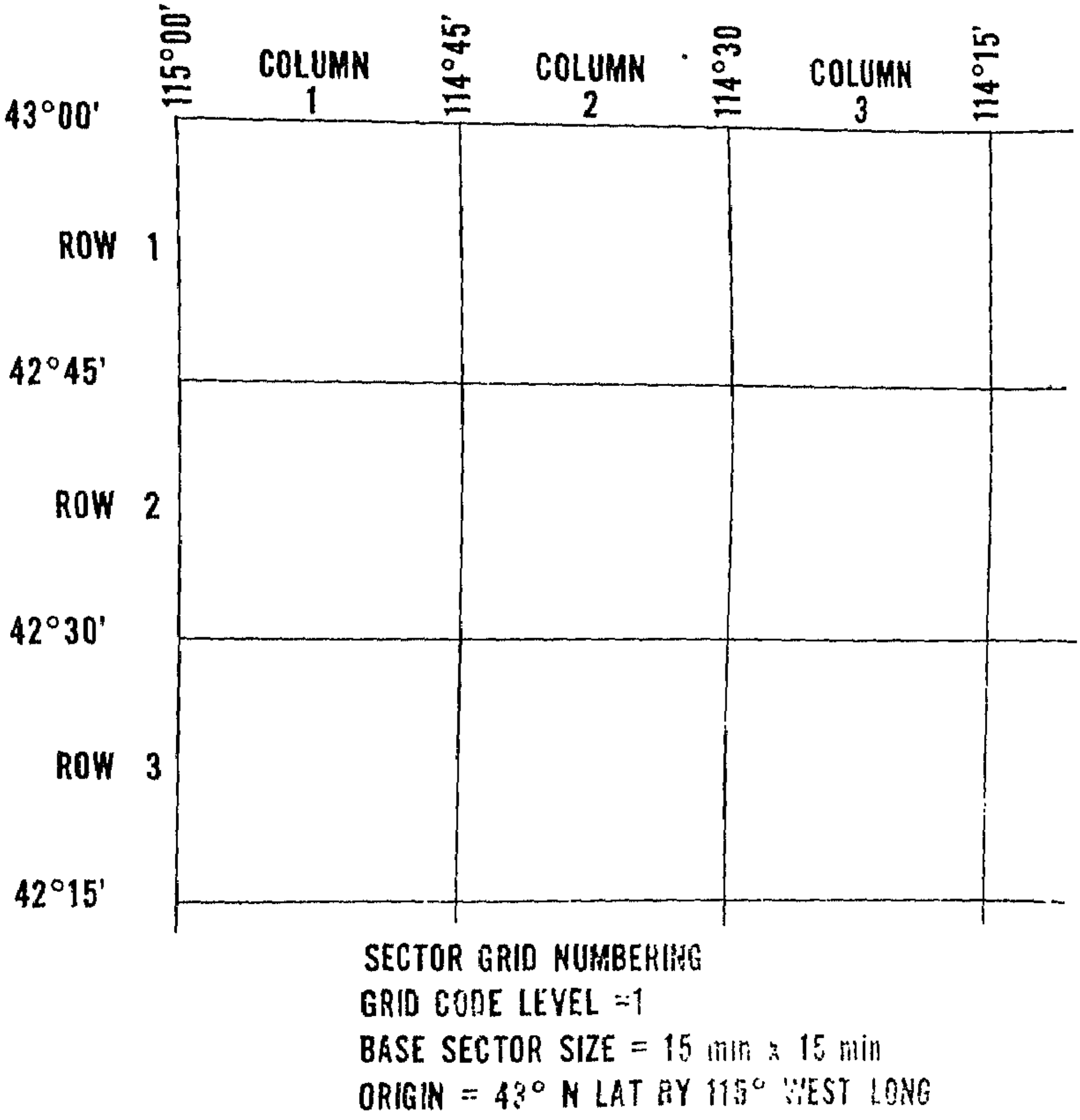


Exhibit A10.---Sector grid numbering (sector size 15.00 x 15

METHOD I

Each sector is subdivided into rectangular cells called elements. There are 120 element columns across each sector. The number of element rows down each sector is either 120 or 90 depending on whether the lines per inch subfield of the grid code is specified as 8 or 6 respectively. This arrangement allows a map sector consisting of 14400 or 10800 elements respectively, to be displayed as an array of characters on a line printer (Exhibit A11). The sectors can then be taped together to form a complete map.

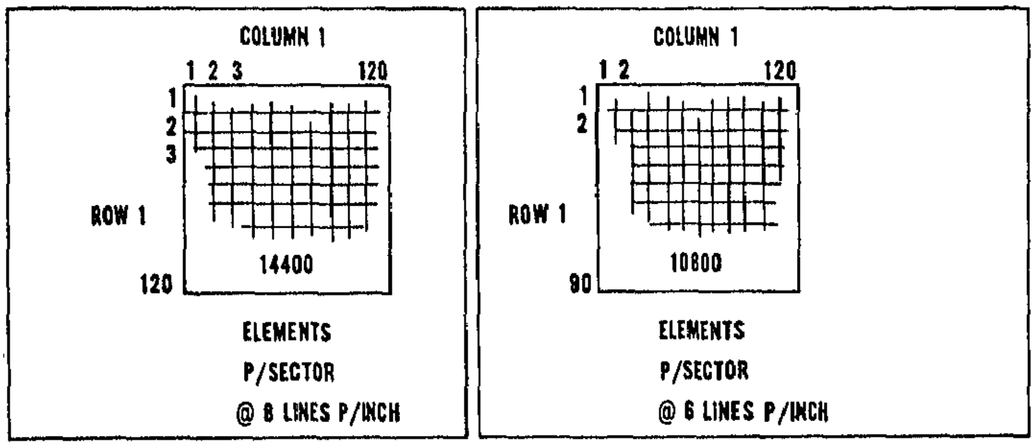


Exhibit A11.--Sector subdivision - elements

Although the specified sector size of a map does not effect the scale of the output map, it controls the area calculations for the map. Establishing the correct sector size is, therefore, necessary in order to obtain correct area statistics from GRID.

METHOD I

When using this method to input your cell data into the GRID system you are utilizing the system as it was designed. That is, to use the geographic reference system and the Grid Codes available in GRID (see Exhibit A9).

_ _ _ _ Remainder of page deleted

3) Input From P-Cards

P-Cards are used to generate an element matrix for input to GRID. That is, each cell within a sector must be accounted for by a single character entry on the P-Card. See Appendix A for a complete description of the P-Card.

If the map is input from P-Cards then the scale of the output map depends on the scale of the source map, the mesh size of the grid that will be used to hand code the P-Cards, and the printing characteristics of the line printer on which the output map is displayed. Therefore, the following relationship exists:

X-direction SX = CX/(GX*PX) (Equation 3)

Y-direction SY = CY/(GY*PY) (Equation 4)

Where:

CX . . The scale of the source map in the x-direct

GX . . The mesh size of the grid in the x-directio

PX . . The number of characters per inch printed i
the x-direction

SX . . The scale of the output map in the x-direct

Suppose for example, that the source map has a sca of 1:24,000, that the mesh size of the grid is 0.1 in the x-width by 0.125 in the y-height and that t line printer produces pages which have 10 characte per inch across and 8 characters per inch down.

Then we have:

$CX = 24000$ $\quad$ $CY = 24000$

$GX = 0.10$ $\quad$ $GY = 0.125$

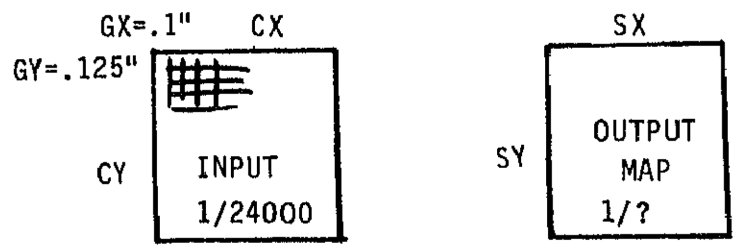
$PX = 10$ $\quad$ $PY = 8$

and so substituting in equations (1) and (2),

$$SX = 24000/(0.10*10) = 24000$$

$$SY = 24000/(0.125*8) = 24000$$

The output map will therefore have a scale of 1:24,000.



4) Base Sector Grid Code Change, (Batch Mode Only)

A user may want to change the origin of his data from the systems default of latitude 53°N and longitude 128°W. An example would be if a Forest desires to have the sector row/

To change these entries, input a REFERENCE Card with the following information at the beginning of the runstream:

Columns 1 through 9	REFERENCE
Columns 11 through 20 (BX in ex. 7.223)	Extent in the x direction (longitude), expressed in minutes-per-sector of the base sector. (Grid code 1). Decimal point must be entered.
Columns 21 through 30 (BY in ex. 6.533)	Extent in the y direction (latitude), expressed in minutes-per-sector of the base sector. Decimal point must be entered.
Columns 31 through 40 (44°05'00" = 44.0833)	The reference latitude in decimal degrees. Decimal point must be entered.
Columns 41 through 50 (71°25'00" = 71.4166)	The reference longitude decimal degrees. Decimal point must be entered.

1 9	11 20	21 30	31 40	41 50	
REFERENCE	7.223	6.533	44.0833	71.4166	

NOTE: The following procedure is used to determine how many acres will be represented by each cell either for input to GRID or as an output of GRID.

Determine acres per cell

Given:

Cell Dimensions

Square feet per acre 43560

Map scale 1/24000

Output printer character dimensions in inches

SAMPLE PROBLEM

a) X = 24000/10 = 2400 inches per cell in x

Y = 24000/6 = 4000 inches per cell in y

b) Convert inches to feet for both x and y

x = 2400 ÷ 12 = 200 feet

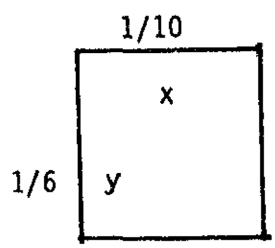
y = 4000 ÷ 12 = 333.33 feet

c) Convert to square feet per cell

200 x 333.33 = 66666.7

d) Convert to acres per cell

66666.7 ÷ 43560 = 1.53 acres per cell



OUTPUT PRINTER
CHARACTER DIMENSIONS
IN INCHES

5) <u>Sector Computation Examples</u>

The following sample problem describes the procedure used in METHOD 1 (see Exhibit A12) to calculate sector row--column values for input into GRID. This example shows how to convert geographic coordinates to GRID sector row--column.

GIVEN:

--Input map sheet--7.5' quad

--Scale = 1:24000

--Input map size is equal to one

sector

a -- Determine Sheet Size:

Measure x and y of map sheet in inches:

Example x = 17.5 inches

y = 22.0 inches

b -- Sector Size of Map in Minutes

x = 7.5 minutes

y = 7.5 minutes

c -- Determine Degrees Per Sector in Longitude (x) and Latitude (y)

Given: Minutes per degree = 60

1) Compute degrees per sector longitude

$$\text{Degrees p/sector long.} = \frac{\text{sector size in minutes}}{\text{minutes per degree}}$$

$$DX = \frac{7.5}{60} = 0.125 \text{ degree per sector}$$

2) Compute degrees per sector latitude

$$DY = \frac{7.5}{60} = 0.125 \text{ degree per sector}$$

Exhibit A12.--Sample problem - Method I

d -- <u>Determine Sector Row/Column Locations of NW Corner of Input Map Sheet</u>

Given: - Base sector longitude = 128°

- Base sector latitude = 53°

- Geographic value (in degrees) of NW corner of input map

  71.417 longitude*

  44.083 latitude*

- Degrees per sector in longitude

  DX = 0.125

- Degrees per sector in latitude

  DY = 0.125

Compute location of sector column/row

$$\text{Sector column} = \frac{\text{base sector long.-long. input map}}{\text{degree per sector longitude}}$$

$$C = \frac{128° - 71.417}{.125} = 452.664$$

Repeat computation for row (latitude)

$$R = \frac{53° - 44.083}{.125} = 71.336$$

NOTE: Use digits of whole number only, i.e., 452 and 71

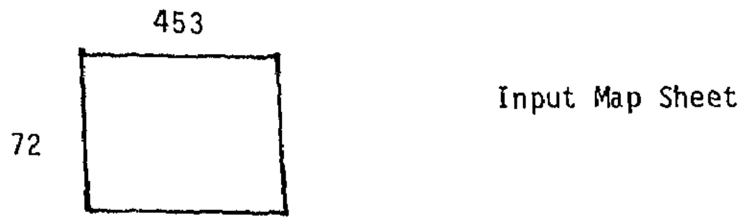
* Note minute and second values of geographic coordinates must be changed to decimal, i.e., 71°25'00" - Change minutes to decimal 25÷60 = .417 then 71.417°

'xhibit A12.--Sample problem - Mehtod I (continued)

d one (+1) to the computed values to identify sector row and lumn where the NW corner of the input map sheet appears.

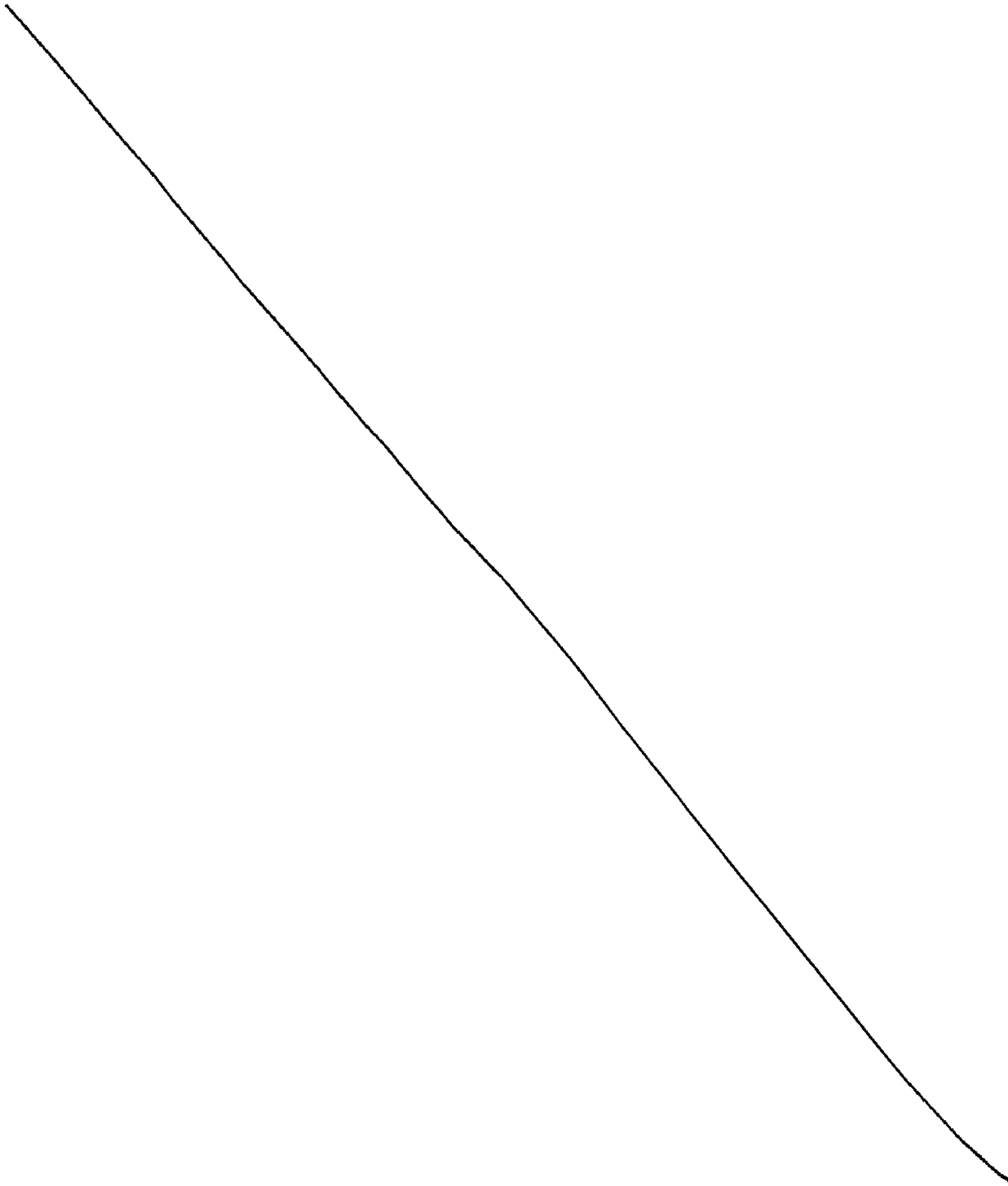
Hence $C = 452 + 1 = \underline{453}$

$R = 71 + 1 = \underline{72}$



Enter the value -- sector column 453 and row 72 in columns 29 thru 34 on the "G" input card.

Exhibit A12.--Sample problem - Method I (continuec



4. Map Types and Forms

Maps, as defined within GRID, appear in a variety of types and forms. Exhibit A13 provides a graphic representation of the basic relationship between the various map configurations.

The elements of a map when printed on the page, may be represented by numbers exclusively (numeric map) or by a combination of letters, numbers and special characters (alpha maps). The numeric maps provide the ability to distinguish between elements within a map on the basis of some discrete quantitative characteristic and also can lend themselves to mathematical manipulation. Alpha maps are generally used for storing data with a large number of unique categories and for special display purposes.

Real-valued maps allow continuous quantitative information to be stored and present a great advantage to the user for arithmetic composition. They, however, cannot be displayed unless their values are transformed into a discrete set (numeric or alpha).

Boundary maps are derived from alpha or numeric maps or are created from a digitized data source. What they actually contain are the boundaries separating homogeneous areas within the parent maps (county, tract boundaries, etc.).

Real-valued, numeric and alpha maps can be used to describe a geographical area in terms of a single characteristic such as Timber Crown Diameter Classes, soil type, or annual rainfall. Timber Crown Diameter

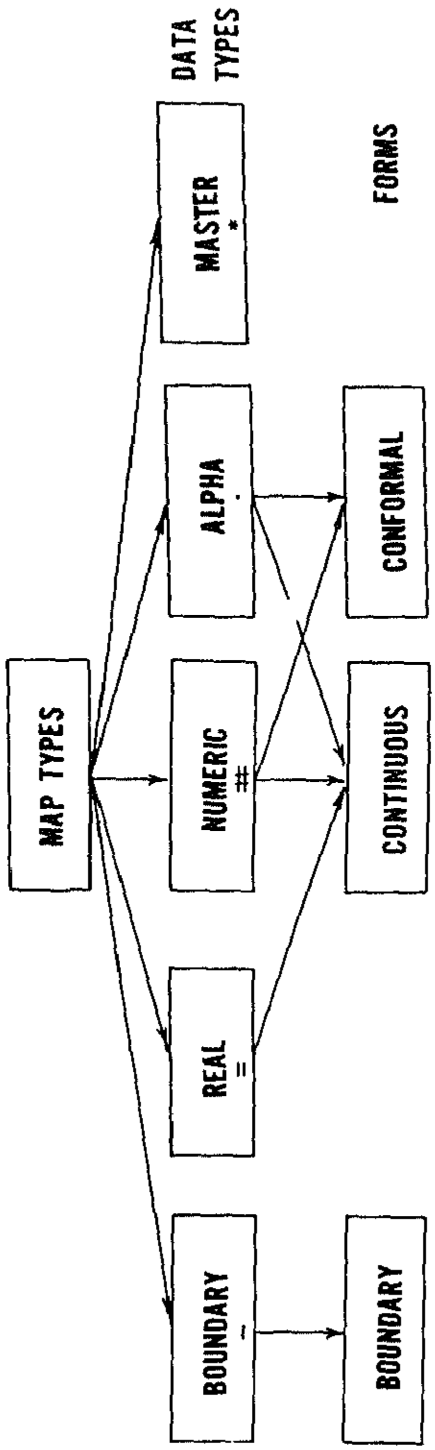


Exhibit A13.--Grid map types

Classes and annual rainfall are quantitative measures and as such would probably be best described by a real-valued map or, in the case of a map to be displayed, in numeric terms where each of the digits (zero through nine) represents, in ascending scale, a range of values. Soil type is a characteristic which is generally qualitative in its use. Each discrete soil type can be equated to a different print character. In such a case an alpha map is suitable because the names of different <u>soil types</u> do not lend themselves to mathematical operations. Another reason why an alpha map is preferable is that the number of different soil types may exceed the available ten digits to which one is limited on a numeric map. In cases of quantitative characteristics the scale ranges can be set to form ten or fewer categories, (see below); however, in the case of discrete qualitative characteristics, the larger number of symbols available in the alphanumeric character set may be required.

SYMBOL		FEET
0	=	10
1	=	12
2	=	14
3	=	16
4	=	18
5	=	20

The numbers appearing in the elements of individual numeric topic maps must be considered as indices. This is so because the attribute being displayed is divided into ten (or fewer) classifications, each of which is assigned a digit. These assigned digits or index numbers are used in such a way that a higher number generally represents better or more desirable conditions. For example, the elements with higher numbers could represent more desirable locations in terms of a target or goal than elements with lower numbers. These index numbers are unique to their definitions. It would not be correct, therefore, for the reader to presume that a "3" as an element value indicates that this location whose element contains a "2". All that one can say is the location indicated by a "3" is better than those which have "2's," but not as good as those locations represented by "4's" or higher numbers.

Maps which describe geographical areas in terms of a single characteristic, either quantitative or qualitative are called topic maps. There are three fundamental forms of topic maps: conformal (block), continuous and master maps.

Conformal maps are those where the basic geographic shape conforms to some previously defined boundaries such as

counties or regions. In these maps, all elements within an area, for example, a county, are of uniform value which represent the statistical total or average reported for the area. This type of conformal or block mapping is characteristic of most socio-economic data, and is quite acceptable for economic analysis. Conformal maps can be either numeric, alpha or real.

Exhibit A14 gives an example of an alpha conformal topic map. In this case, the element values within the sector vary with the county boundaries. Each county has a unique alphanumeric element symbol. Exhibit A15 gives an example of a numeric conformal topic map. Median family income is expressed with the values ranging from one to nine. The boundaries of similar element values correspond in general with the alpha conformal topic map of Exhibit A14 since the median income statistics were originally collected on a county basis. Adjacent counties having equal median income ranges will have their county boundaries suppressed.

Continuous maps show variations from element to element where data are available in fine grain for such topics as soil types, intensity of land use, or amount of rainfall over the area. Continuous maps may be either real-valued, numeric or alpha. Exhibit A16 gives an example of a numeric continuou

Master maps are generally created for the express purpose of storing geographic shapes such as county boundaries, State boundaries, planning regions, etc. Master maps may be created either from digitized data files or by manual means. Master map names begin with an asterisk such as *COUNTY to designate a master map at the county level.

Composite topic maps are new topic maps based upon some expression relating any number of topic maps. For example, a composite topic map indicating feasible locations for certain mineral processing facilities might be derived from topic maps showing mineral accessibility, rail accessibility, power accessibility, pipeline accessibility, labor accessibility, and local buildable land.

Study Area Reference

Whenever a map analysis study is to be conducted, a GRID Study Area Reference should be constructed. This brief reference shows valid entries for file names, grid codes sector identifications, and topic names. A reference of this nature can reduce the time required to complete GRID parameter cards as well as reduce the frequency of input errors as the result of invalid entries. Ideally, the Study Area Reference would be in looseleaf form to facilitate easy updating.

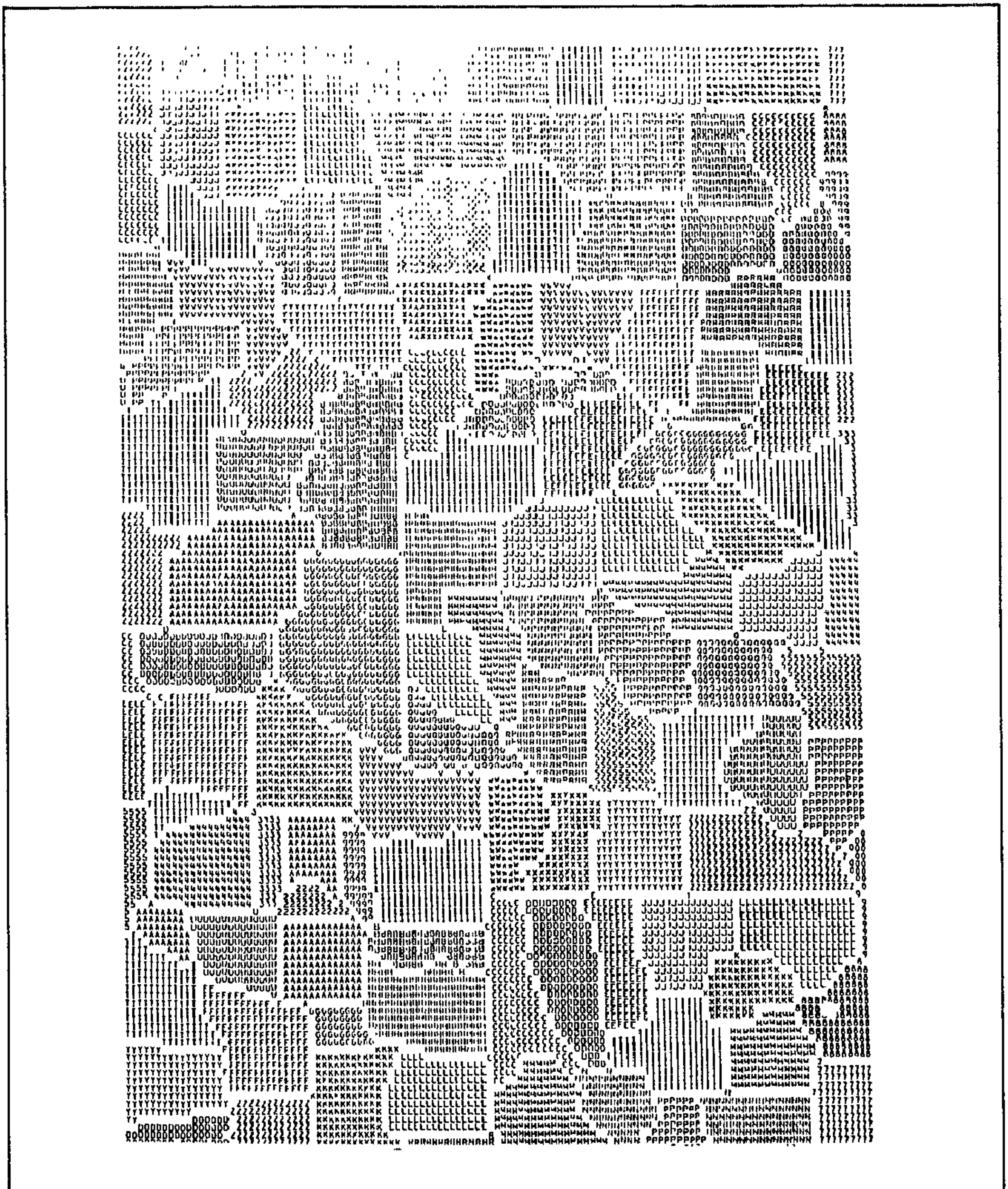


Exhibit A14.--Alpha conformal topic map

Exhibit A15.--Numeric conformal topic map - grey tone

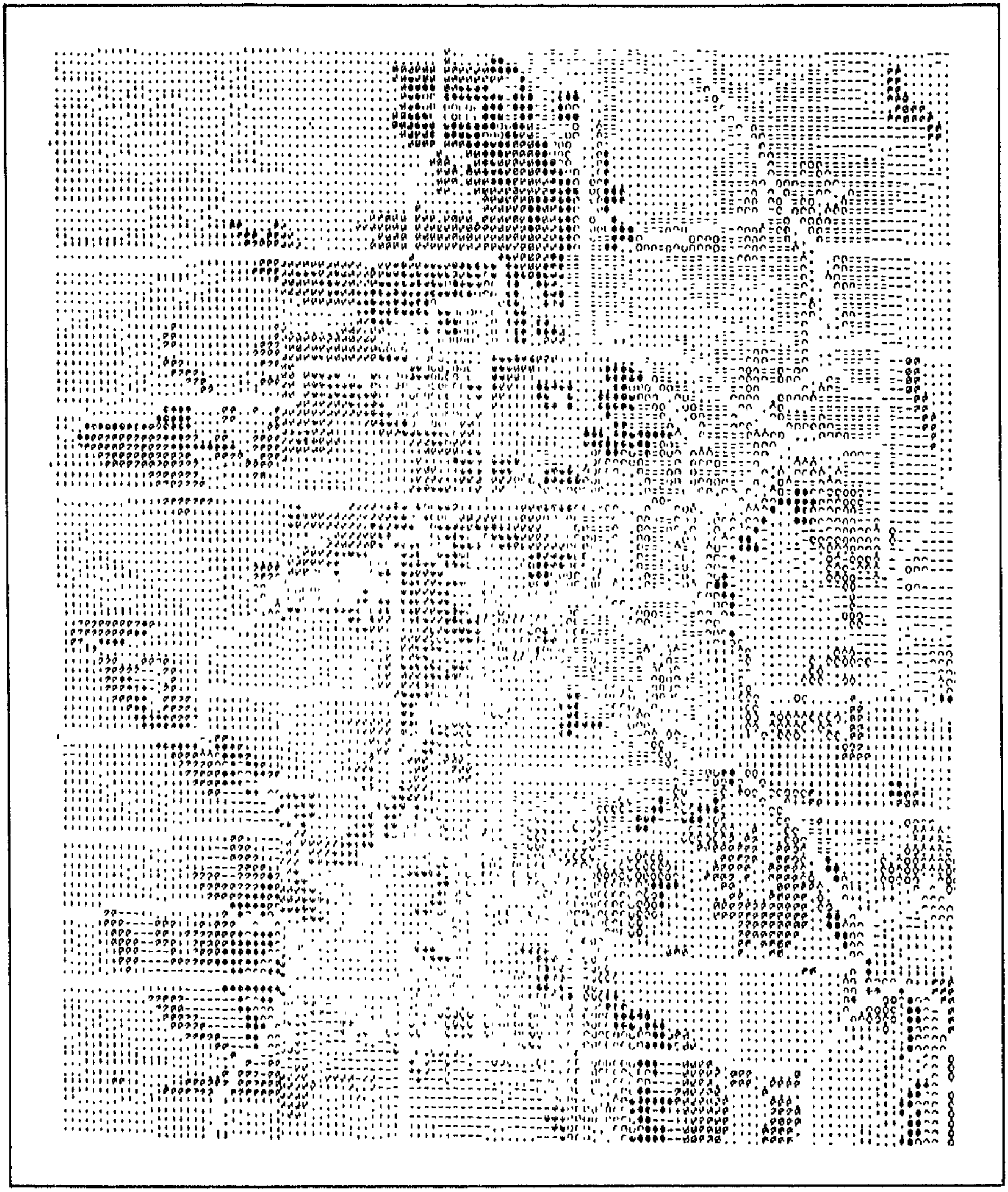


Exhibit A16.--Numeric continuous topic map - grey tone.

5. Data Format

a. Topic and value grid type mapping involves storing data in a manner similar to map overlays or layers of information. These layers of information are known a topics. The maximum number of topics one expects to store is limited only by the availability of tape storage. The data elements of a topic are known as elements and they are coded with either alpha or numeric characters. Authorized characters for RAP are:

-	=	+	*	,	$	/	(	)	A	B	C	D
F	G	H	I	J	K	L	M	N	P	Q	R	S
U	V	W	X	Y	Z	9	8	7	6	5	4	3
1	Ø											

There are 44 characters that can be used, note that the letter "O" and the period "." are not valid characters.

b. Data collected for a topic should describe in the m basic way the characteristics of the topic. For example, "high erosion hazard" as a value name for soil topic places an interpretation of the land, bu definite classification of the data, with such fact as slope, ph, and soil type, simply describe the m basic characteristics of the soil. Such individua nonintegrated data provides much greater flexibili of use and objectivity.

6. Data Base Drafting

At this point, sector row/column, element row/column, grid cell size, and map scale have been identified.

a. Supplies needed to begin project:

(1) Master Grid--a mylar of the selected grid with appropriate row and column numbers and rectilinear study area boundaries.

(2) Code sheets--mylar copies of the master grid to be used for coding values. One copy will contain all the coded values for one topic.

(3) I.D. Strips--two identification (I.D.) strips are used on each sector. One is attached to the left side of the code sheet to identify the row of the sector. The other I.D. strip is attached to the top of the sector and contains card column numbers. This is explained in more detail in Section 3 (2 and 3).

b. Procedure for obtaining supplies:

(1) Obtain master grid mylar:

There is a program at FCCC that produces a grid format which divides the input map sheet into 120 rows by 120 columns. The program is called RID*GRID.GRIDDER. The grid is created by either inputting geographic coordinate values or map dimensions of the source map.

The program can be run at the Forest terminal but the grid must be plotted at the Regional Office

and mailed to the Forest. (Use @MSG command to specify "Plot on mylar with black ballpoint" for description of plots.)

To input geographic coordinate values use runstream: _A_. To input map dimensions use th runstream: _B_.

RUNSTREAM A

DEMAND TERMINAL
RUNSTREAM TO EXECUTE GRIDDER PROGRAM -- OPTION -- 1
INPUTTING GEOGRAPHIC COORDINATES

```
>@RUN
DATE:  032778  TIME:  072918  AUTONEWS OFF
>@ASG,A RID*GRID.
FACILITY WARNING  000000000200
>@ASG,T 7,///1000

READY
>@XQT RID*GRID.GRIDDER

INPUT OPTION--1, IF INPUTTING GEOGRAPHICAL COORDINATES
      OPTION--2, IF INPUTTING MAP DIMENSIONS

>1
      OPTION 1--INPUT TYPE OF REFERENCE SPHEROID--1, 2, or 3
                NO. 1:  CLARK 1880 SPHEROID
                NO. 2:  INTERNATIONAL
                NO. 3:  CLARK 1866
>3
      OPTION 1--INPUT LATITUDE AND LONGITUDE OF THE SOUTHWEST
                CORNER OF A QUAD AS DEG,MIN,SEC,DEG,MIN,SEC

>43,15,0,73,0,0
                INPUT LATITUDE AND LONGITUDE OF THE NORTHEAST CORNER
                AS DEG,MIN,SEC,DEG,MIN,SEC

>43,30,0,72,45,0
                INPUT MAP SCALE
>31680
>@ASG,CP RIDS*PLOTPRT1    User supplied file name
READY
@USE P, RIDS*PLOTPRT1
READY
>@BRKPT PRINT$/P                                        Optional
>@MSG,N PLOT ON MYLAR WITH BLACK BALL POINT PEN
>@XQT RDS*RDS.CALT
>@BRKPT PRINT$
>@FREE P
READY
>@SYM RIDS*PLOTPRT1,, (USE YOUR OWN SITE ID)
>@FIN
```

RUNSTREAM B

DEMAND TERMINAL

RUNSTREAM TO EXECUTE .GRIDDER PROGRAM -- Option - 2
INPUTTING MAP DIMENSIONS

```
>@RUN
DATE: 032778  TIME: 073711   AUTONEWS OFF
>@ASG,A RID*GRID.
FACILITY WARNING   000000000200
>@ASG,T 7,///1000
READY
>@XQT RID*GRID.GRIDDER
INPUT OPTION--1, IF INPUTTING GEOGRAPHICAL COORDINATES
            --2, IF INPUTTING MAP DIMENSIONS
>2
      OPTION  2, FOR A GIVEN QUAD, INPUT THE VERTICAL MEASUREMENT
                 IN INCHES FIRST, THEN THE LOWER BASE LINE
                 MEASUREMENT IN INCHES, THEN THE UPPER BASE LINE
                 IN INCHES AS INCHES1,INCHES2,INCHES3
>17.25,12.60,12.58
>@ASG,CP RIDS*PLOTPRT2

READY                          User supplied file name


@USE P, RIDS*PLOTPRT2
READY                                                     Optional
>@BRKPT PRINT$/P
>@MSG,N  PLOT ON MYLAR WITH BLACK BALL POINT PEN
>@XQT RDS*RDS.CALT
>@BRKPT PRINT$

>@FREE P

READY
>@SYM RIDS*PLOTPRT2,, (USE YOUR OWN SITE ID)

>@FIN
```

(2) Obtain Code Sheets. Send master grid mylar to local duplicating firm. Request one mylar copy for each topic to be coded.

(3) Obtain ID Strips. ID strips are made from cut up sections of prints of the master grid before rows and columns are numbered and the boundary delineated.

c. Development of Master Grid.

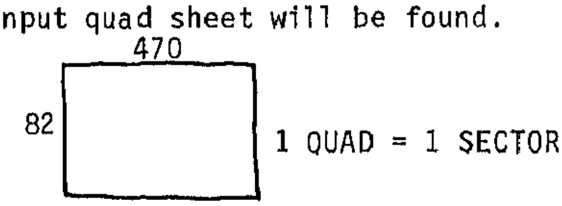
(1) Divide Grid

METHOD I - The master grid is created as one sector which covers the entire source map.

__ __ __ __ Portion of page deleted

(2) Identify the sector row/column.

METHOD I - This is the value computed on page which designates the sector in which the NW corner of the input quad sheet will be found.



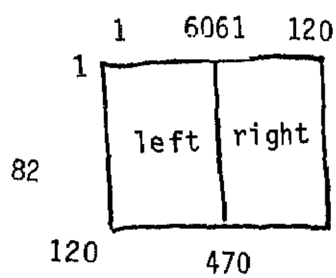
(3) Delineate Boundary on Master Grid. This ofter involves transforming curvilinear lines into a rectilinear grid pattern. For cells adjacent to the intended boundary, if 50 percent or more of scale the cell falls within the study area, include the cell within the boundary.

(4) Obtain mylar copy of master grid for each topic. These will be used as the code sheets.

d. Coding Values - overlay mylar code sheet on source map and record appropriate values. A cell may have only one coded value per topic.

e. Prepare Code Sheet for Keypunching. Values are keypunched on cards which are read by the computer. There are 80 columns on a keypunch card.

(1) Since each sector contains 120 rows by 120 columns, it is necessary to divide the columns in half for coding purposes and to designate them as right hand and left hand side.

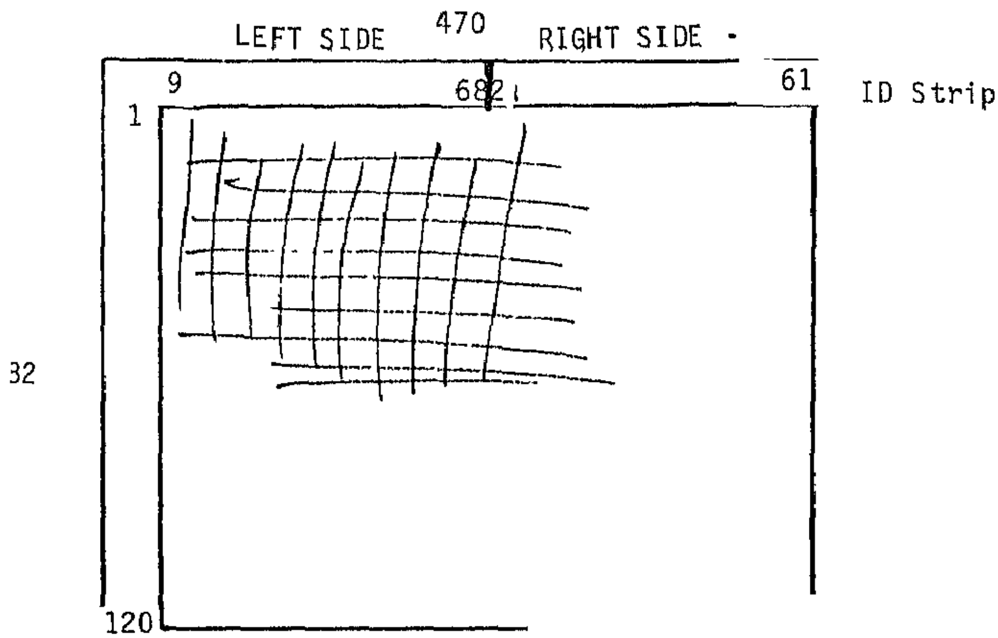


__ __ __ __ Portion of page deleted

(2) Beginning with the NW sector, attach an ID strip to the left side to identify the rows 001 thru 120.

(3) Again at the NW sector attach an ID strip to the top of the sheet to identify columns 9 thru 68 for left hand side and 2 thru 61 for right hand side.

PREPARE CODE SHEET FOR KEYPUNCHING



① DIVIDE SECTOR IN HALF

② ATTACH ID STRIPS NW CORNER

(4) Then record the cell values on an 80 column coding s
similar to a FORTRAN coding form as shown in Exhibit
first line entered on the coding form is to enter th
request card of "A" card ('A' card always necessary)
illustration purposes the sample "A" card contains t
lowing information:

Column 1 Identifies card as "A"

Columns 3-14 Requester A. B. DICK

31-36 Action CREATE a map file

('CREATE' indicates active mode and requires a @ASG,T 7.,U9V)

58 No Input Map File "X" denotes new fil
being created

61-72 Map File Name "BENCHRAP"

The second line entered on the coding form is to en
topic denfinition card or "G" card ('G' card always
sary). A complete discussion of the "A" and "G" ca
found in Appendix A. For illustration purposes the
card contains the following information:

Column 1 Identifies card as "G"

3 Grid Code Type "C" (Optional-no longer used)

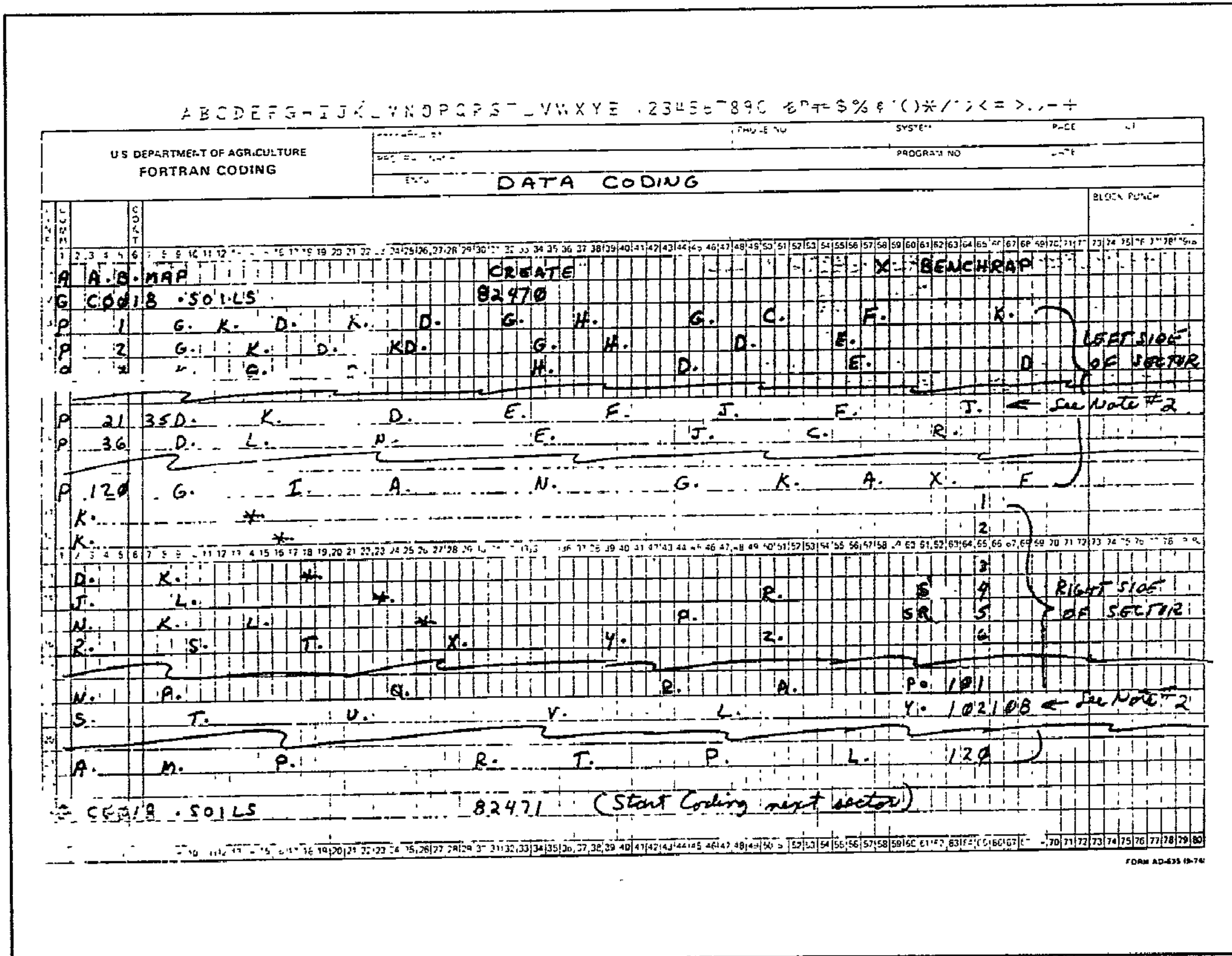
4-6 Grid code level 001 (See Table 2)

7 Grid code lines-per-inch "8"

9-21 Topic Name (.SOILS)

29-31 Sector Row Number 82

32-34 Sector Column Number 470



ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 =+$%'()*/,<=>.-+

U S DEPARTMENT OF AGRICULTURE
FORTRAN CODING

DATA CODING

```
A A.B.MAP                     CREATE               X BENCHRAP
G CODI8 .SOILS                82470
P   1  G. K.  D.  K.  D.  G.  H.  G.  C.  F.  K.
P   2  G.  K.  D.  KD.  G.  H.  D.  E.
d      H.  D.  E.  D.
P  21 35D.  K.  D.  E.  F.  J.  F.  T.  <- See Note #2
P  36  D.  L.  N.  E.  J.  C.  R.
P 120  G.  I.  A.  N.  G.  K.  A.  X.  F
K.      *                                  1
K.        *                                2
D.   K.  *                                 3
J.   L.   *   R.                       S   4
N.   K.  L.  *  A.                     SR  5
Z.   S.  T.  X.  Y.  Z.                    6
N.   A.  Q.  R.  A.                    P. 101
S.   T.  U.  V.  L.                    Y. 102108 <- See Note #2
A.   M.  P.  R.  T.  P.  L.              120
CODI8 .SOILS           82471  (Start Coding next sector)
```

LEFT SIDE OF SECTOR

RIGHT SIDE OF SECTOR

FORM AD-635 (9-74)

Exhibit A17.--Sample coding form

(5) Record the cell value for input on a "P" card as shown b

See Appendix A for a complete discussion on the use of t

card. All left side data is keypunched first followed b

right side data entries.

a. To record the left side:

Column 1 Identify card as "P"

3-5 Starting row number

6-8 End row number

9-68 Left hand side cell values

b. To record the right side:

Column 2-61 Right hand side cell values

63-65 Start row number

66-68 End row number

NOTE #1: At any point in the data matrix with the except of the first data position at each left and right hand ca a period (.) may be used to indicate the column repetitio the previous data value until a new data value in the sam in encountered.

NOTE #2: If you have an area where the rows have identic values for the entire row and they are duplicated in succ sive rows the data may be entered in block form. See coc form line numbers 7 and 20, Exhibit A17 for example. Thi indicates that the cell data for rows 21 thru 35 and 102 108 are identical.

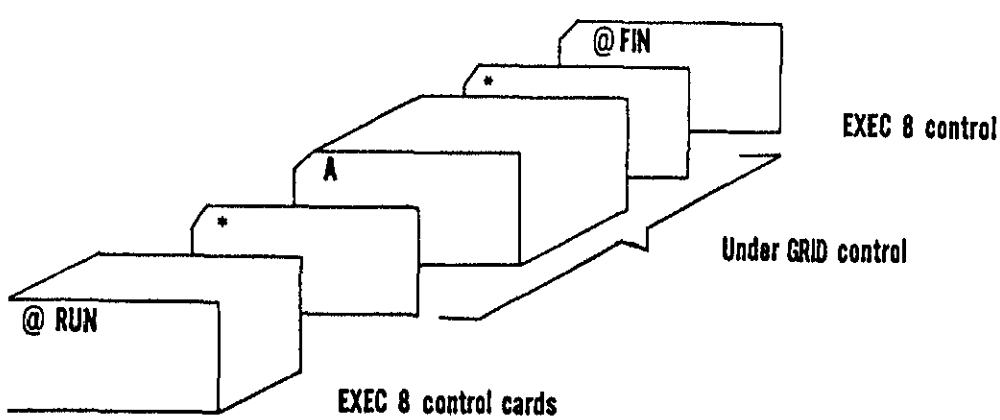
(6) NOTE: All cells must be accounted for in a sector. For those cells that fall outside the study area the user selects a unique character to code these null cells. In the data manipulation phase this null cell is suppressed so that these cells are not counted in the calculations.

The cost of keypunching and verifying is approximately $0.105 per card. To determine the number of cards to be punched, multiply the number of cards per row times the number of rows. Keypunching turnaround time is influenced by size of data base (number of cells and variables) and by number of digits per coded value. Turnaround time will rarely exceed 1 week.

Input Forms

1. General

All input cards must have the card type indicated in column 1. This applies to Batch Processing and to Demand Mode of operation. In Batch Processing the input deck must be preceeded by an asterisk card and must be followed by an asterisk card. The input deck should look as follows:



NOTE: See Appendix A for complete description of input cards.

2. Initial Run-Passive

Now that you have all your data coded and cards prepared for inpu GRID, the following procedure is recommended for initial input of data. The initial run will be in a passive mode, that is, no fil be created. The purpose of the initial run is to obtain an outpu be used for editing and verification purposes.

Phase I will list the original input, error messages if any and printed output with all cells filled in. The initial run is exe in the batch mode. Data is input one sector at a time and each is identified by a "G" Card. The following is a sample runstrea the initial input of data (see Exhibit A18).

SAMPLE RUNSTREAM

```
@RUN
@ASG,A RID*GRID                    GRID PROGRAM FILE
@XQT,OU RID*GRID.GRID
*  Asterisk Card
A  Personal Identification Card
G  Topic Definition Card
*I Legend Input
P  Data Cards
T  Statistical Parameters          First Topic/First Sector
Z  Map Display
G  Topic Definition Card
*I
P                                  First Topic/Second Sector
T
Z  (Repeat until all sectors are inputted)
G  Second topic/First Sector
G  (Repeat until all topics/sectors are inputted)
*  Asterisk
@  FIN
```

The I cards are optional at this time.
legend or title information. See Appe
Explanation of I card.

ABCDEFGHIJ KLMNOPQRSTUVWXYZ 1234567890 ¢"#$%& ()*/;:<=>.,--

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FORTRAN CODING

INITIAL RUN- PASSIVE

```
@RUN,/TPRNC WS1FG1,123456789012,ROGER,10,100 (Your Run Card)
@ASG,A RID*GRID.
@XQT,OU RID*GRID.GRID
                                                          (No Input Map File)
A A-B-MAP        GEOMETRONICS                             X   BENCHRAP (Topic file name)
G C0018 .SOILS (Topic Description)  82470 (Section Row/Column)
I ⊢ (User inputs desired legend)
P 001    ⊢ (Data Cards left side)
P
P 120
P ⊢ (Data Card right side)                                          001
P                                                                   120
I HI X  (HI = Histogram  X = suppress graph)
Z (Map display)        0xx        . (suppress null symbol "x")
              (Produce boundary outline)
G C0018 .SOILS                      82471
    (Repeat P thru Z for each section)
*
@FIN
```

Exhibit A18.--Sample runstream
(Part 1 of 2)

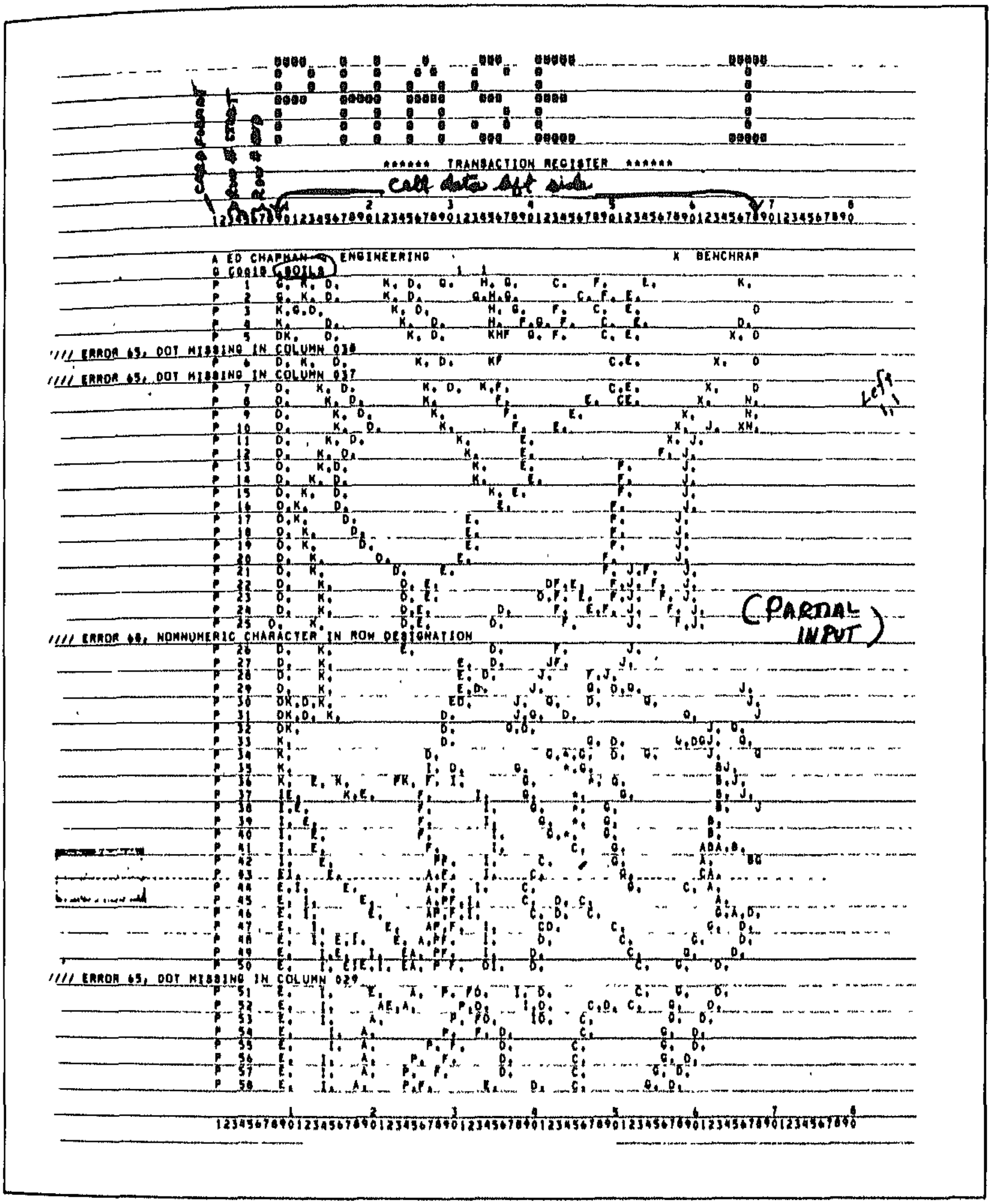


Exhibit A18.--Initial run - passive
(Part 2 of 2)

3. Verification Run-Passive

Upon completion of editing your input data cards and updating your deck with corrected data, you then rerun your deck to obtain clean output copies of your input data. This run is executed in the same manner as inputting your initial data. This output will be a verification of the edited data deck. It will include Phase I input listing and Phase II, the topic generation and display file (See Exhibit A20).

4. Create Initial File-Active

Once you are satisfied with your corrected data you then input the data in an active mode to "CREATE" a permanent tape file. The following suggested runstream is executed in a batch mode to create a permanent data file. (Exhibit A21.)

@RUN

@ASG,A RID*GRID.

@USE 9, (QUAL*FILENAME) This is your output file

@ASG,T 9, U9V

@XQT, OU RID*GRID.GRID

(Runstream identical to initial input, and obtaining verification plots. With the exception of entering "CREATE" in the action field of A-card.)

@FIN

Your output will be; Phase I, an input listing, Phase II,

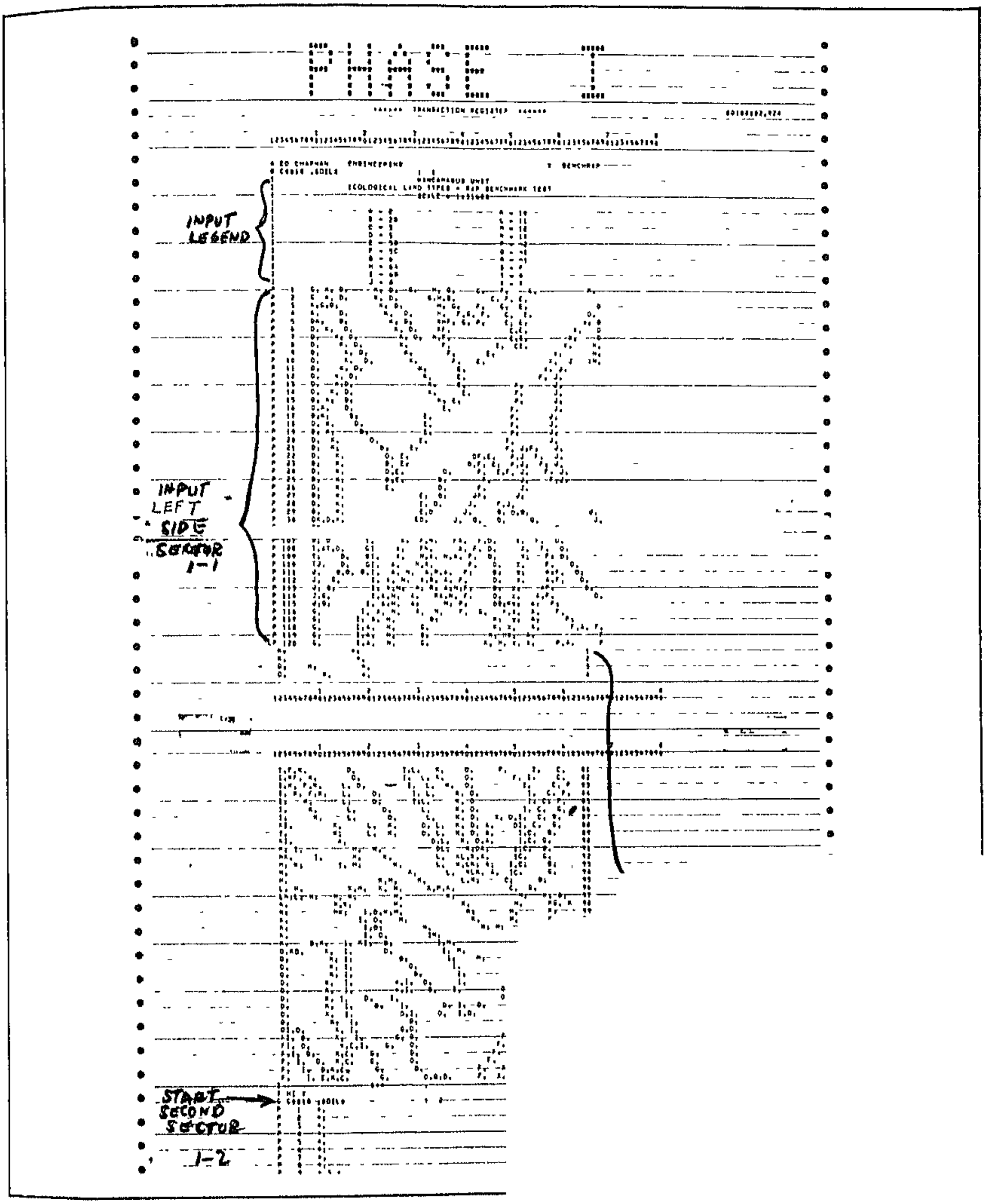


Exhibit A19.--Verificatior
(Part 1

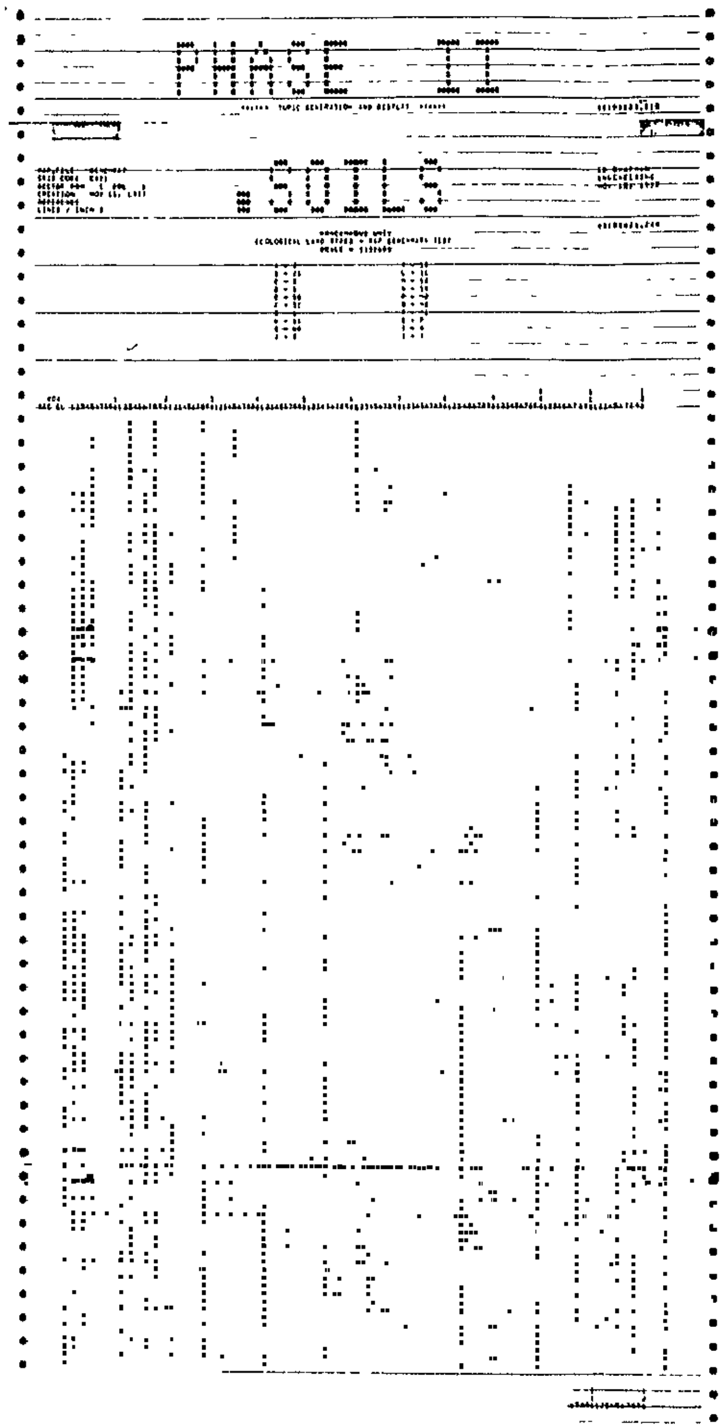


Exhibit A19.--Verification run/map - passive (Part 2 of 3)

MAP,FILE BENCHMAP
GRID CODE 17610
HISTOGRAM

ED CHAPMAN
ENGINEERING
NOV 15, 1977

00:00:27.232

KANCAMAGUS UNIT
ECOLOGICAL LAND TYPES - MAP BENCHMARK TEST
SCALE = 1:31680

A = 2	K = 10
B = 28	L = 11
C = 3	M = 12
D = 5	N = 14
E = 58	P = 42
F = 5C	Q = 40
G = 6	R = 41
H = 6A	S = P
I = 68	T = 4
J = 8	X = X

TOPIC ,SOILS

SYMBOL	FREQUENCY	PERCENT OF TOTAL	ACRES	SQ. MILES
*	405.	2.81	809.23	1.26
A	1319.	9.16	2637.44	4.12
B	31.	.22	61.97	.10
C	1550.	10.76	3098.82	4.84
D	2984.	20.72	5967.13	9.32
E	796.	5.53	1591.02	2.49
F	1503.	10.44	3005.30	4.70
G	901.	6.26	1801.86	2.82
H	159.	1.10	317.93	.50
I	1138.	7.90	2276.05	3.56
J	407.	2.83	813.83	1.27
K	1549.	10.75	3089.64	4.83
L	540.	3.75	1080.21	1.69
M	406.	2.82	812.26	1.27
N	242.	1.68	483.80	.76
P	49.	.34	97.97	.15
Q	75.	.52	149.98	.23
R	9.	.06	18.01	.03
S	213.	1.48	425.61	.67
T	11.	.08	22.02	.03
X	117.	.81	234.00	.37
TOTAL	14400.	100.00	28793.62	44.99

Exhibit A19.--Verificatic
(Part :

PHASE I

****** TRANSACTION REGISTER ******

00100102.41

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
A ED CHAPMAN     ENGINEERING    CREATE                          X  BENCHMAP
C C0018 .TIMBER
```

[illegible]

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
P   10 13H, J.,
P   14 17HJ, .,
P   18 21K,J,.,
P   22 40J,  .,
```

[illegible]

```
C C0018 .POL                          2  1                             1120
```

[illegible]

```
C C0018 .POL                          2  2
```

[illegible]

```
                                                                       1120
```

PHASE II

****** TOPIC GENERATION AND DISPLAY ******

00100125.

PHASE III

****** NEW MAP FILE GENERATION ******

00100125

THE FOLLOWING RECORDS WERE EITHER CREATED, MODIFIED OR DELETED ON THE NEW MAP FILE BENCHMAP

ACTION	GRID	MAP TOPIC	SECTOR	BLOCK	DATE	PARENT MAP
CREATE	* C0018	.POL	1001	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	1001	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	1002	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	1002	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	2001	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	2001	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	2002	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.POL	2002	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	1001	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	1001	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	1002	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	1002	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	2001	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	2001	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	2002	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.SOILS	2002	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.TIMBER	1001	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.TIMBER	1001	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.TIMBER	1002	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.TIMBER	1002	2	DEC 01, 1977	P=CARDS
CREATE	* C0018	.TIMBER	2001	1	DEC 01, 1977	P=CARDS
CREATE	* C0018	.TIMBER	2001	2	DEC 01, 1977	P=CARDS
[illegible]	[illegible]	TIMBER	2002	1	DEC 01, 1977	P=CARDS
[illegible]	[illegible]	TIMBER	2002	2	DEC 01, 1977	P=CARDS

le output create initial file - act

5. Adding New Topics

To add new topics to an existing file the procedure is identical to inputting data in an initial run-passive mode. Edit your data, rerun to obtain verification plots in the passive mode then once you are satisfied with your input add new data to your existing file with the following suggested runstream.

```
@RUN
@ASG,A RID*GRID.
@ASG,T QUAL*FILENAME (your existing file name) U9V, F12345
@USE, 7 Existing File
Note Unit 7 is used to input existing file.
@USE 9, QUAL*FILENAME (new file name)
Note Unit 9 is used to output a map file
@ASG,T 9, U9V
@XQT, OU RID*GRID.GRID
*



Input Data
*
@FIN
```

Once your run has been successfully executed do not forget to save your file.

C. Data Manipulation - GRID

1. Summary

The program RID*GRID is a FORTRAN program to store, retrieve, manipulate, and combine information that has an on-the-ground relationship. The program features:

-- An ability to display a single topic, from combining layers of resource and physical data such as soils, topography, vegetation, etc.

-- A fully labeled line-printer map display with quantitative output such as statistical area summaries and histograms.

-- A geographic base system of which the data base is keyed t latitude and longitude map coordinates. This facilitates the registration and location of the output map.

-- Topic maps can be created using linear combinations.

2. Data Display

a. General - The data is "displayed" or "mapped" with row and column numbers as elected. There are four basic display options that are available with GRID.

(1) Single character display is limited to the 44 input characters (see Exhibit A22).

(2) Gray scale display can only be obtained when cell coded data contains numeric values (0-9), one to ten levels of coded values of a single topic can be displayed on one map. The "Z-card" is used to define the gray scale output (see Exhibit A27).

(3) The geographic boundary outlines may be displayed by themselves or suppressed from the output (see Exhibits A23 and A24).

(4) Selective display of portions of an area or sector (window display) by using the "W" input card (see Exhibit A28).

b. Map Generation can be generated and printed at the Forest computer terminal or generated and printed on the line printer in the Regional Office. Turnaround time will depend on processing priority and mailing. As mentioned in the section on data base development, line printer characters occupy a rectangular area 1/10" wide by 1/8" high. The line printer has the capability to:

(1) Print six or eight lines per inch depending on the

desired map scale (see Exhibit A9 under data base develo

(2) Overprint characters to obtain desired gray scale s

(3) Produce statistical reports; user can suppress the output and obtain statistical outputs only if requested.

(4) Slow speed terminals such as demand terminals are n suitable for large map display requests and are not alwa capable of producing overstrike characters to produce a scale output map.

3. Data Mapping Options

GRID is a generalized system which is user-oriented and ope for future expansion. "User-oriented" refers to the abilit operate the system without the need for a programer, and "o ended" refers to the structuring of the GRID logic such tha additional features can be incorporated without extensive r graming. For illustration purposes the following display m options will be discussed:

-- Single topic display

1) Cell data only without geographic boundary outline
2) Cell data with boundary printed solid
3) Cell data with boundary outline dropped out
4) Geographic boudary outline only

-- Intersection

1) Alpha output

-- Linear combination

1) Numeric output

2) Gray scale

-- Window display

1) With geographic boundary outline

2) Cell data only

-- Text Overlay

1) Titling Map Features

a. Single Topic Display

One to forty-four (1-44) coded values of a single topic can be displayed on one map. If there are more than 44 values coded for a single topic and the user wishes to display all values, more than one map must be generated.

Sample - Single Display

The user wants to display values by topic, geographic area outline, and obtain acreage calculations.

Topic to be displayed:

*Ecological land types

Values to be used:

*A-N, P-T, X total 20 values

Sample runstream with boundary printed, Exhibit A21

Sample runstream without boundary, Exhibit A22

Sample runstream outputs with boudary only, Exhibit A23

Sample runstream with boundary drop-out, Exhibit A24

The following suggested runsteam is used to obtain single topic display

* @RUN (Your run card)

* @ASG, A RID*GRID. (Program file)

* @ASG, T RIDS*BMRAP3., U9V, F10759 (Input file)

* @USE 7, RIDS*BMRAP3

* @XQT, OU RID*GRID.GRID

** (Asterisk Card)

REFERENCE (User specified sector origin)

* A (Mapping Request)

* G (Topic Definition)

* I

T (Statistics Parameters)

Z (Map Display)

** (Asterisk Card)

* @ FIN

* These cards are required for all runs

See Appendix "A" for explanation of Input Card Formats

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0 ⌀ ¤ # $ % ¢ ' ( ) * / : ; < = > . , - +

U.S. DEPARTMENT OF AGRICULTURE FORTRAN CODING	PREPARED BY	PHONE NO	SYSTEM	PAGE OF
	PROGRAM NAME		PROGRAM NO	DATE
	COMMENTS SINGLE TOPIC - DISPLAY WITH BOUNDARIES			BLOCK PUNCH

```
O@RUN
O@ASG,A RID*GRID.
O@ASG,T RID*3MR4P3.,U9V,F40759 (Input File)
O@USE 7.,RID*3MR4P3
O@XQT,OU RID*GRID.GRID
O*          (x-deviation)  (y-deviation)  (Ref. latitude) (Ref. longitude)
REFERENCE 7.223         6.533          44.Ø833         71.4166   (User-specified origin)
                                                              BENCHRAD (Topic filename)
OA RIDS DEMO
OG CØØ18 SOILS (topic definition) 1 1 1 (Sector Row/Column)
I
I                  DISPLAY WITH BOUNDARIES PRINTED
I                               SOILS
I                         SCALE 1:31680
I   T Cards are
I   used for                                       K - 1Ø
I   inputting        A - 2                          L - 11
I   titles or        B - 2B                         M - 12
I   legends          C - 3
I
I
T HI
Z                  Ø+*           • (Suppresses null symbol "*")
            (Boundary outline)
O*
O@FIN
 O = Required for all executions
```

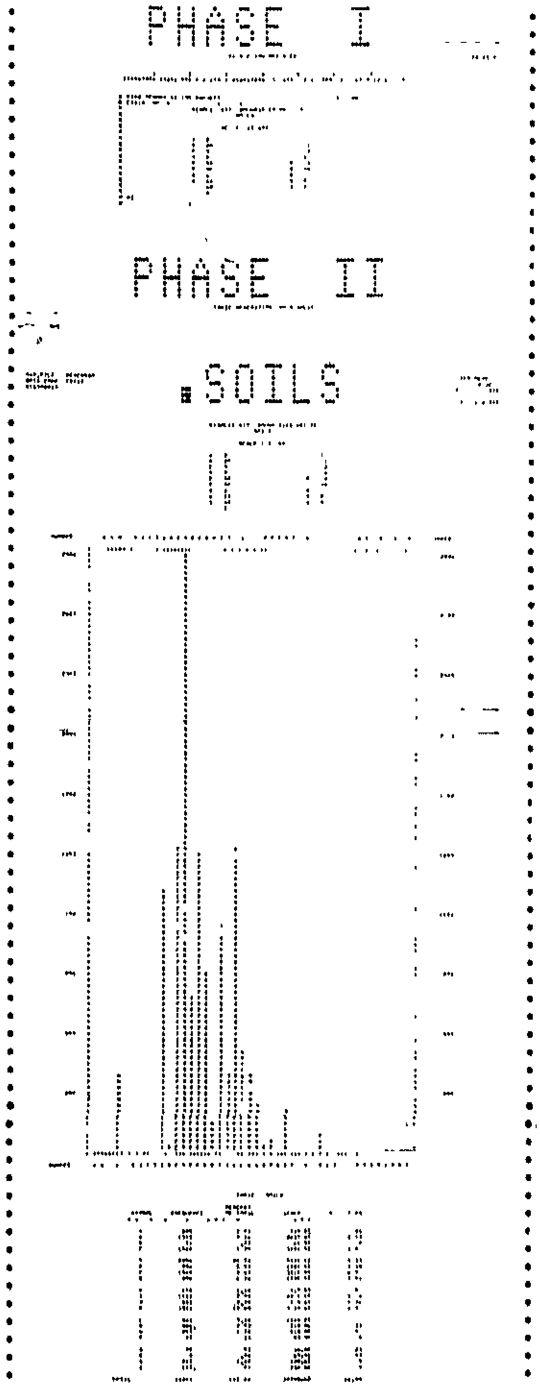
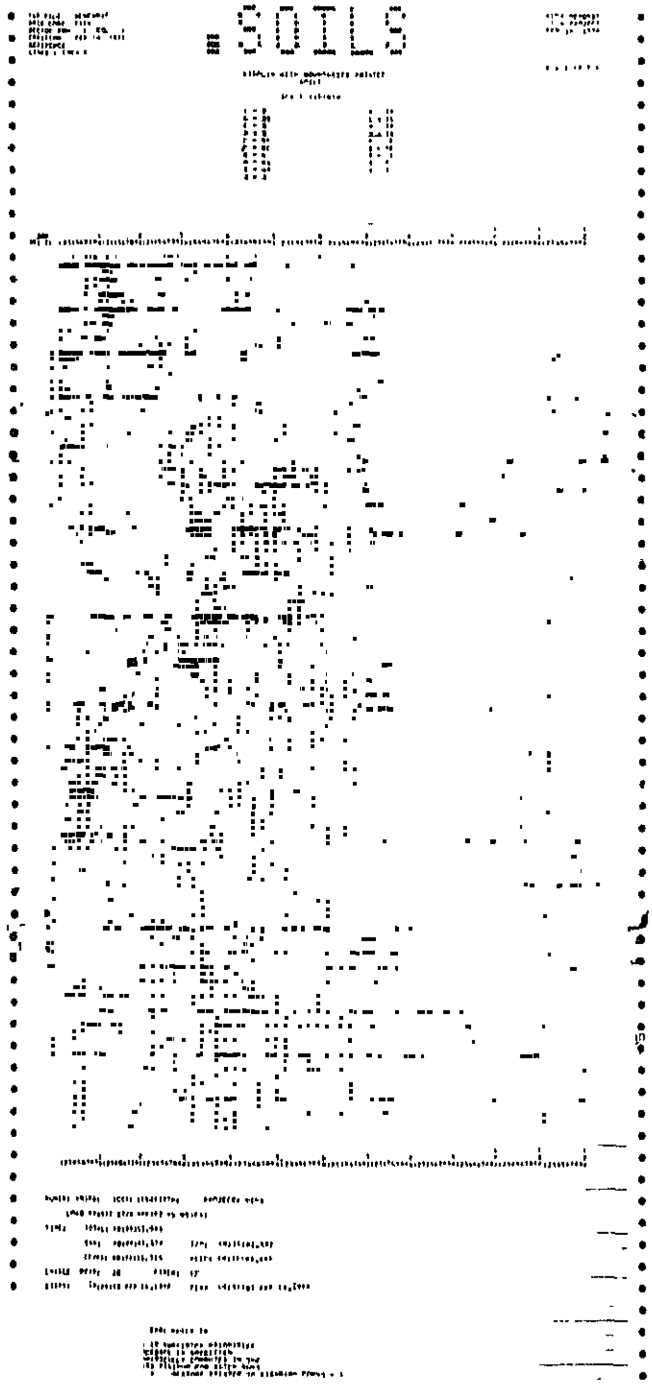


Exhibit A21.--Single topic display
(Part 2 of 3)



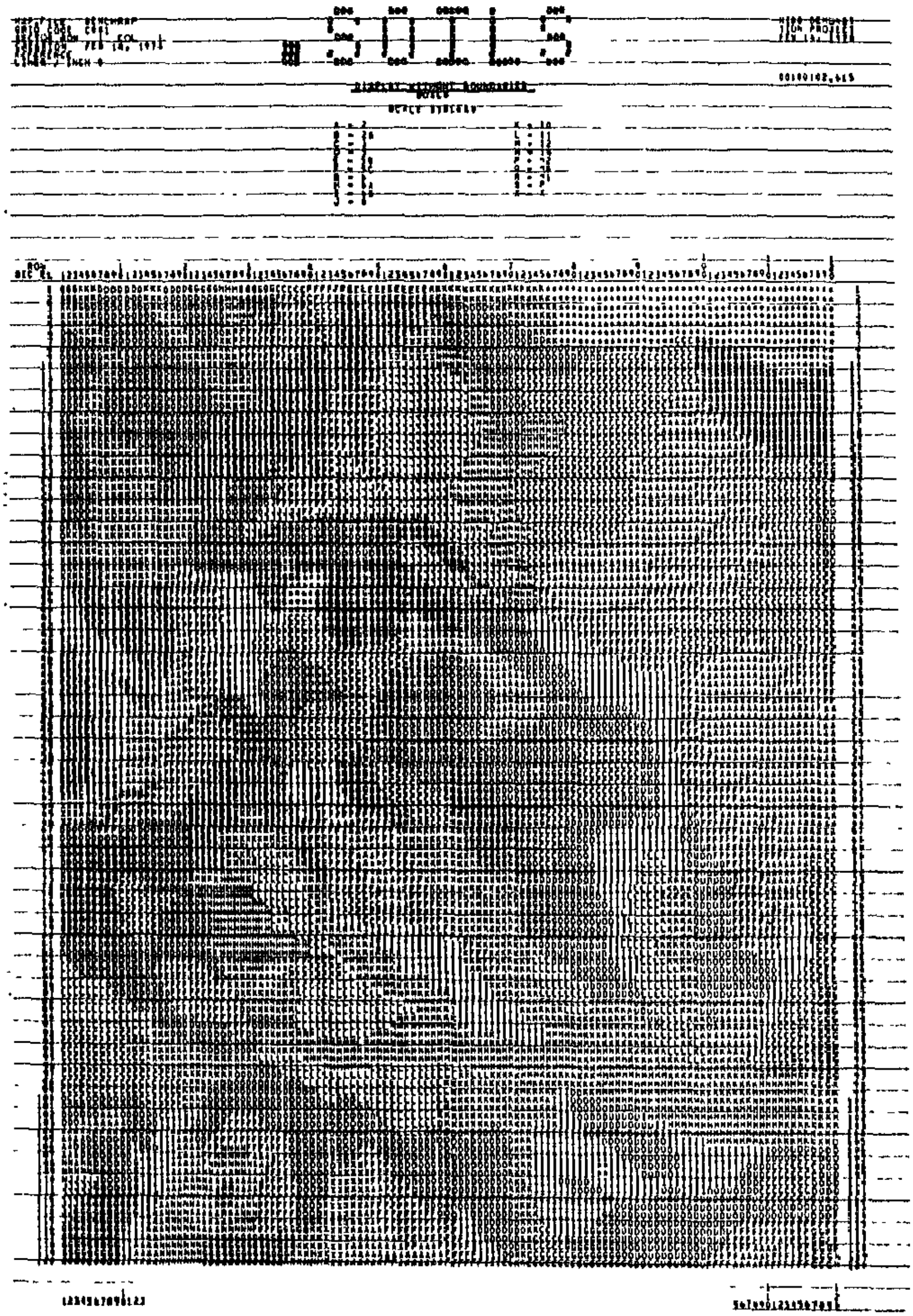
'isplay map with boundaries so
. 3 of 3)

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

COMMENTS: SINGLE TOPIC DISPLAY - WITHOUT BOUNDARIES

```
@RUN
@ASG,A RID*GRID.
@ASG,T RID*BMRAP3.,U9V,F10759 (Output File)
@USE 7,RID*BMRAP3
@XQT,OU RID*GRID.GRID
*
REFERENCE 7.223      6.533      94.0833    71.4166
A RIDS DEMO                                                  BENCHRAP
G C0018 SOILS             1    1    1
I
I                       DISPLAY WITHOUT BOUNDARIES
I                                  SOILS
I                              SCALE 1:31680
I
I
I                   A - 2                          K - 10
I                   B - 23                         L - 11
I                   C - 3                          M - 12
I
I
Z (Map display no option)
*
@FIN
```

Exhibit A22.--Single topic display without boundaries (Part 1 of 2)



output - single display without boundar
(Part 2 of 2)

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

SINGLE TOPIC DISPLAY - BOUNDARIES ONLY

```
@RUN
@ASG,A RID*GRID.
@ASG,T RID*BMCRAP2.,U9V,F04977 (Output File)
@USE 7,RID*BMCRAP2
@XQT,OU RID*GRID.GRID
*
REFERENCE 7.223   6.533   44.0833   71.4166
A RIDS DEMO                                  BENCHRAP
G C0018 .SOILS           1   1   1
H
I
                  BOUNDARIES ONLY
                       SOILS
              SCALE 1:31680

      A - 2                      K - 10
      B - 23                     L - 11
      C - 3                      M - 12



  ***        .     ......................    *(Mask symbol)
(...ary outline) (Suppress "*") (Suppress symbols)
```

Exhibit A23.--Single topic display runstream
(Part 1 of 2)

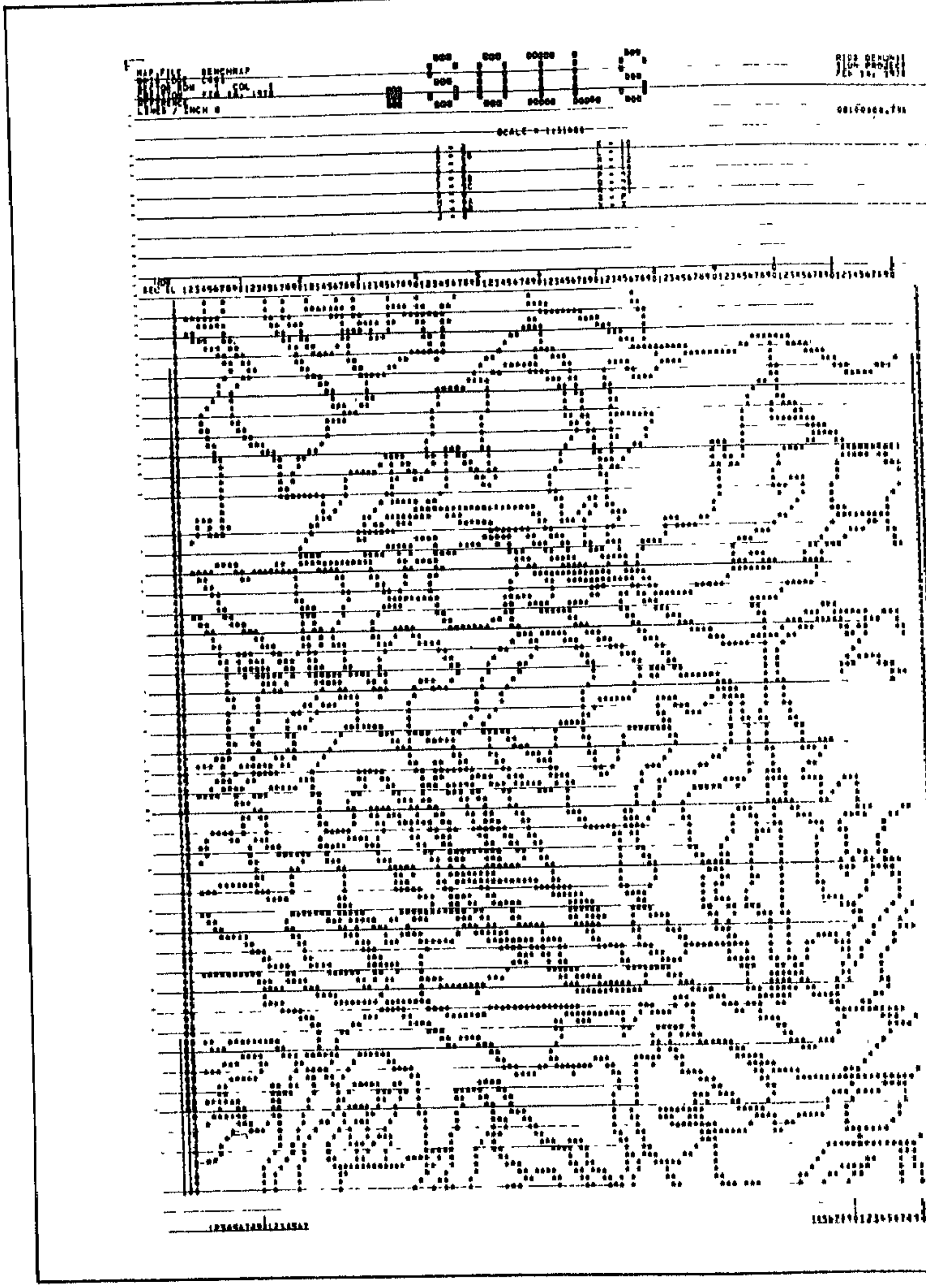


Exhibit A23.--Sample output - single display bounda
(Part 2 of 2)

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

SINGLE TOPIC DISPLAY — BOUNDARIES BLANK

```
@RUN
@ASG,A RID*GRID
@ASG,T RID*DMEAP3.,U9V,F10759 (Input File)
@USE 7,RID*DMEAP3
@XQT,00 RID*GRID.GRID
*
REFERENCE 7 223      6.533      44.0833    71.4166
A RIDS DEMO                                                BEN
G C0018 SO             1  1  1
I
I                 DISPLAY WITH BOUNDARIES BLANK
I                              SOILS
I                        SCALE 1:31680
I
I                 A - 2                    K - 10
I                 B - 2B                   L - 11
I                 C - 3                    M - 12
I
I
I
T HI
Z              (Suppress boundary symbol)
*
@FIN
```

Exhibit A24.--Single topic display with boundaries blank (Part 1 of 2)

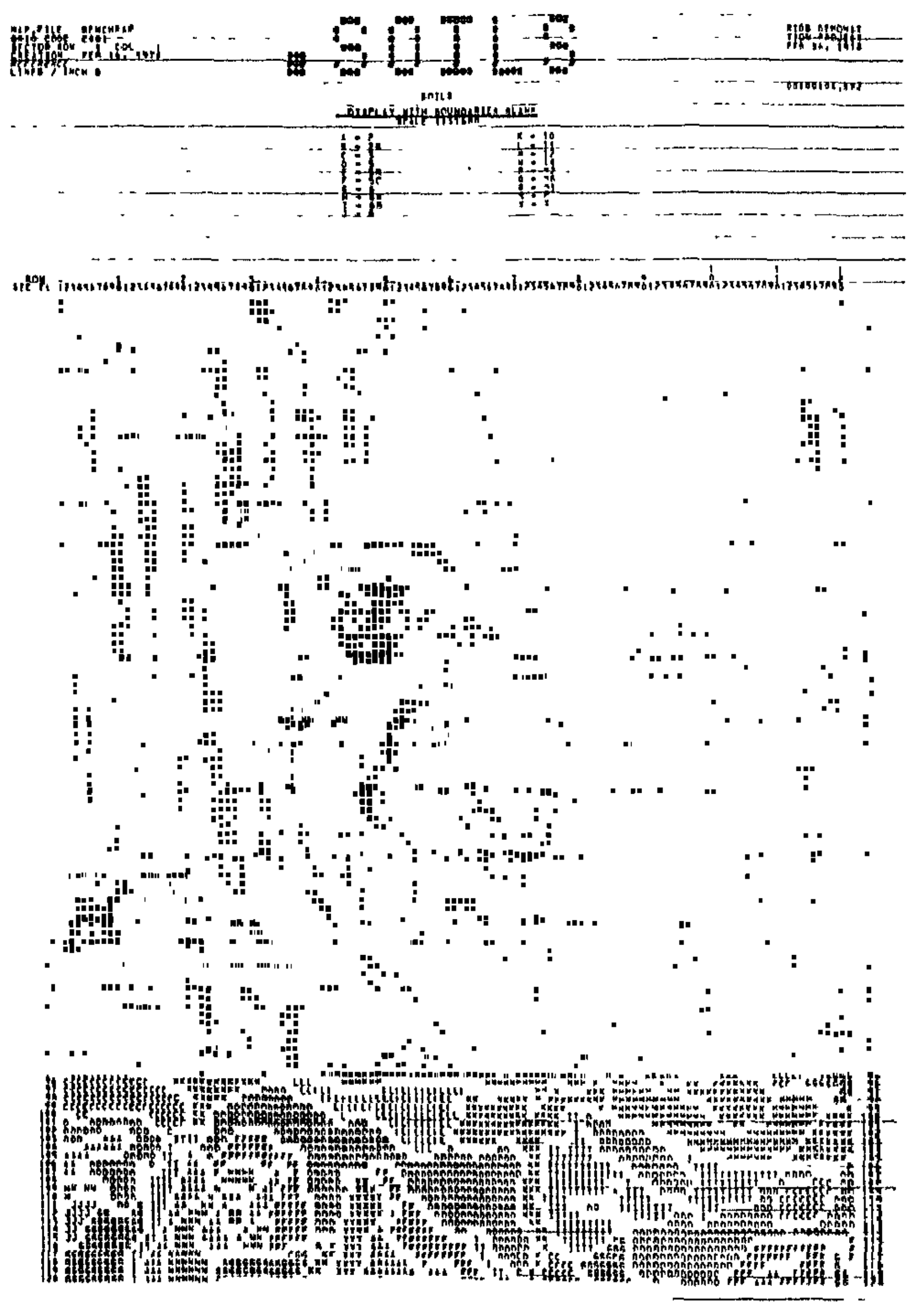


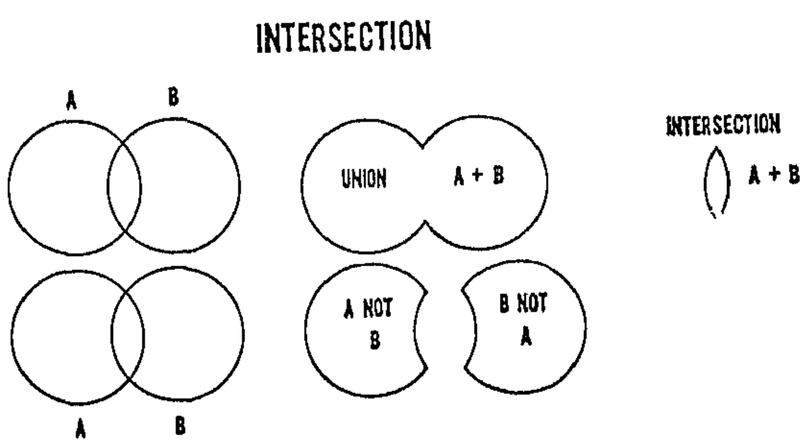
Exhibit A24.--Sample output - single display with bou as drop out (Part 2 of 2)

b. Intersections

Intersections deal with "sets." A "set" in this context is a collection of cells with the same coded value for a stated topic. For example, all cells in the timber type topic data base with timber type A would be considered a "set." A second set would be all cells with site class B, in the site class topic and a third set would be all cells with age class C in the age class topic. The intersection of these three sets would be the shaded area on the diagram.

On a map displaying the intersection, the levels represent selected values of the primary topic of concern. The frequency distribution represents the occurence of cells containing all the selected values of all the sets in the intersection. Cells outside the intersection are not displayed.

Percent of total is always 100 percent. Total acres and square miles represents acreage calculations for intersected values. GRID has the capacity to intersect 10 topics with up to 44 values per topic.



Sample problem: Intersection

The user wants to:

Produce a line printer map and acreage calculation depicting th
intersection of the following selected topics and values:

Timber	Ecological	Political
B9 (B)	2 (A)	Town of Bartlett (A)
NC (W)	5 (D)	Town of Albany (E)
M9 (V)		

( ) - Coded value

NOTE: This option is run in a passive mode unless you want to code a new layer of the resulting code. If the user wants to save the output, a new layer of the intersections must be created and the file saved, otherwise t is executed in the passive mode to obtain outputs only. To create and sav output, use the following runstream (sample run, sample map, Exhibit A25).

```
@RUN
@ASG,A RID*GRID. (Program file)
@ASG,T RIDS*BMRAP2., U9V, F04977 (Your input file)
@USE 7, RIDS*BMRAP2
@USE 9, RIDS*BMRAP3      Use these 2 commands to create an
@ASG,T 9, U9V              output file
@XQT,  RID*GRID.GRID
```

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0 = ' + $ % & ' ( ) * / : ; < = > . , - +

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

PREPARED BY | PHONE NO. | DATE | PAGE OF
PROGRAM NAME | PROGRAM NO.
COMMENTS SAMPLE RUN - INTERSECTION
BLOCK PUNCH

```
@RUN
@ASG,A RIDS*GRID.
@ASG,T RIDS*MAP2.,U9V,E09977
@USE 7,RIDS*MAP2
@XQT,OU RIDS*GRID.GRID
*
REFERENCE 7.233       6.535      44.0833    71.4166
                                                        BENCHMAP
A RIDS DEMO
G C0018 .TISOP6                   1  1  1
I
                       RIDS DEMONSTRATION
T                  SINGLE INTERSECTION DISPLAY
                        SCALE 1:31680
        A = INTERSECTION OF ALL THREE LAYERS
POL]EQL'E')AND((C.SOILS]EQL'A'ORC.SOILS]EQL'D'))   } Map
V'ORC.TIMBER]EQL'V'ORC.TIMBER-1]EQL'B')            } Composition
  INTERSECTION OF SELECTED VALUES FROM 3 LAYERS    } Statistical
                                         *         } Report Heading
             .(Suppress "*")
```

FORM AD-835 (6-74)

ibit A25.--Intersection display
(Part 1 of 4)

PHASE I

****** TRANSACTION REGISTER ******

00100103.108

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
A NIDS DEMONSTRATION PROJECT
C C0010 .TISOPO           1  1  1
                    SINGLE INTERSECTION DISPLAY
                         SCALE = 1:31680
                 A - INTERSECTIONS OF ALL THREE LAYERS
  HISTOGRAM - UNION & INTERSECTION OF SELECTED ATTRIBUTES FROM 3 LAYERS
HI X
```

PHASE II

****** TOPIC GENERATION AND DISPLAY ******

00100106.002

MAP FILE BENCHMAP
GRID CODE C0018
HISTOGRAM

TISOPO

NIDS DEMONST
TION PROJECT
FEB 14, 1978

00100111.589

HISTOGRAM - UNION & INTERSECTION OF SELECTED ATTRIBUTES FROM 3 LAYERS
SINGLE INTERSECTION DISPLAY
SCALE = 1:31680
A - INTERSECTIONS OF ALL THREE LAYERS

TOPIC .TISOPO

SYMBOL	FREQUENCY	PERCENT OF TOTAL	ACRES	SQ. MILES
ANY COMBINATION OF THE FOLLOWING SYMBOLS ARE EXCLUDED *				
A	969.	100.00	1937.90	3.03
TOTAL	969.	100.00	1937.90	3.03

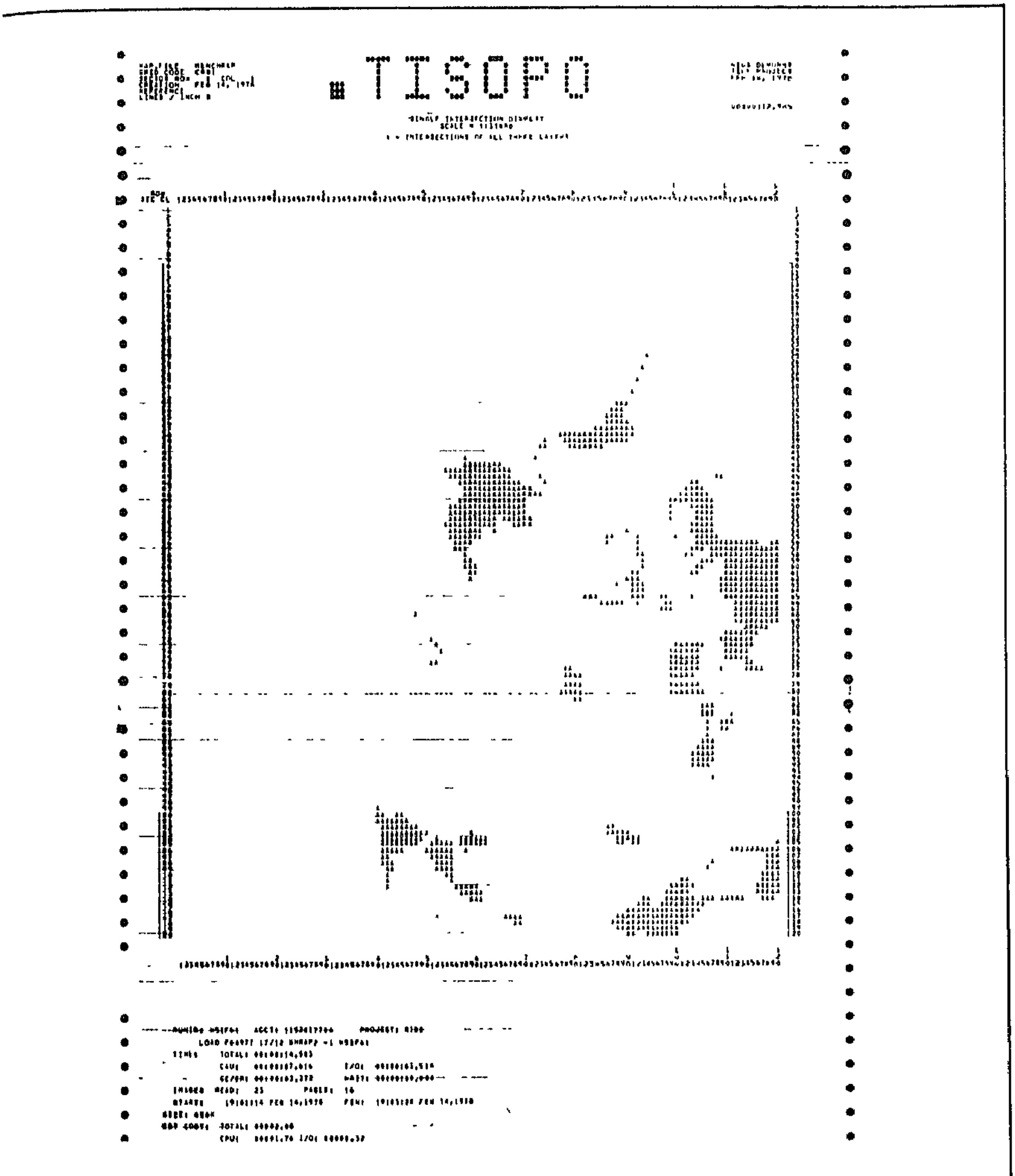


Exhibit A25.--Single intersection map (Part 3 of 4)

THE FOLLOWING RECORDS WERE EITHER CREATED, MODIFIED OR DELETED ON THE NEW MAP FILE BENCHMAP

ACTION		GRID	MAP TOPIC	SECTOR	BLOCK	DATE	PARENT MAP
CREATE	-	C0018	:TISOPO	0	1	JAN 05, 1978	
CREATE	-	C0018	.TISOPO	1001	1	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	1001	2	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	1002	1	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	1002	2	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	2001	1	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	2001	2	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	2002	1	JAN 05, 1978	-THRESHOLD-
CREATE	-	C0018	.TISOPO	2002	2	JAN 05, 1978	-THRESHOLD-

Exhibit A56.--Single interaction - create new layer

c. Linear Combinations

This feature of GRID allows for the display of unique combinations of selected values which could not be accomplished by intersections. GRID has the capacity to manipulate 10 topics with up to 44 values per topic. Normally, the initial input will be 44 alpha, numeric and special characters. To obtain a linear combination a numeric map must be created. That is, those values that are to be used in the linear combination must be recoded to numerics (0-9). The sample runstream (Exhibit A26) shows the method to recode the values and execute the desired linear combination.

A unique combination of selected values is a result of the following process:

1) Identify topics to be used in combination.

2) Identify value(s) that will be used in combination.

3) Only 10 combinations can be displayed. To learn the number of combinations to expect, multiply the number of identified values of the first topic times the number of identified values in the second, etc. Product cannot exceed 10.

4) Assign weights (1-10) to variables if desired.

5) Recode values from alpha to numeric if original input was not numeric.

A linear combination is arrived at by multiplying t
assigned weight of a topic by its value and adding
this product to the products of the other topics
included in the linear combination. (See following
sample problem)

The sum of these products represent
the unique value displayed on the map. Values must
recoded as necessary to obtain the desired unique
combinations. Values not to be considered should
recoded above the maximum expected value.

Sample problem - Linear Combination

1) Topics to be used in combination:

   Timber

   ELT

   POL

2) Values to be used in combination

TOPIC	VALUE
TM	L (1)
ELT	A,D,G, (3)
POL	A,B,E (3)

3) Number of expected combinations:

   1 x 3 x 3 = 9

4)

TOPIC	WEIGHT
TM	1
ELT	3
POL	2

5) TM (Weight 1)

VALUE	L		
RECODE	1		

   ELT (Weight 3)

VALUES	A	D	G
RECODE	1	2	3

   POL (Weight 2)

VALUES	A	B	E
RECODE	1	2	3

Weight of TM x Val	+ Weight of ELT x Val	+ Weight of POL x Val	= Sum
1	3	2	6 (level 1
1	3	4	8 (level 2
1	3	6	10 (level 4
1	6	2	9 (level 3
1	6	4	11 (level 5
1	6	6	13 (level 7
1	9	2	12 (level 6
1	9	4	14 (level 8
1	9	6	16 (level 9

The map will be displayed in 9 levels with the minimum value being 6 and the maximum 16. User can designate the order in which the levels are displayed. The sample output shows the levels being displayed in an ascending order of the summed totals.

Level 1 = TM(L) ELT(A) POL(A)

2 = TM(L) ELT(A) POL(B)

3 = TM(L) ELT(D) POL(A)

4 = TM(L) ELT(A) POL(E)

5 = TM(L) ELT(D) POL(B)

6 = TM(L) ELT(G) POL(A)

7 = TM(L) ELT(D) POL(E)

8 = TM(L) ELT(D) POL(B)

9 = TM(L) ELT(D) POL(E)

(Sample Run, Sample Map Exhibits A27 and A28)

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

PREPARED BY | PHONE NO | SYSTEM | PAGE

PROGRAM NAME | PROGRAM

COMMENTS SAMPLE RUN — LINEAR COMBINATION

```
@RUN
@ASG,A RID*GRID.
@ASG,T RID*BMAAP2.,U9V,F64977
@USE 7,RID*BMAAP2
@XQT,QU RID*GRID.GRID
*
REFERENCE 7.233      6.533      44.Ø833   71.4166
A RIDS DEMO                                            BENCHRAP
G CØØ1/8 =POL               1  1  1
R IF[.POL]EQL'A'THEN'1';
R IF[.POL]EQL'B'THEN'2';            (Map Composition)
R IF[.POL]EQL'E'THEN'3'ELSE'Ø';
G CØØ1/8 =TIMBER
R IF[.TIMBER]EQL'L'THEN'1'ELSE'Ø';  (Map Composition)
G CØØ1/8 =SOILS
R IF[.SOILS]EQL'A'THEN'1';
R IF[.SOILS]EQL'D'THEN'2';          (Map Composition)
R IF[.SOILS]EQL'G'THEN'3'ELSE'Ø';
J     LINEAR COMBINATIONS WITH VALUES LT -  6    Ø               6.   Scaling
J     LINEAR COMBINATIONS WITH VALUES  6 -  8    1       6.      8.
J     LINEAR COMBINATIONS WITH VALUES  8 -  9    2       8.      9.   Interval
J     LINEAR COMBINATIONS WITH VALUES  9 - 1Ø    3       9.     1Ø.
J     LINEAR COMBINATIONS WITH VALUES 1Ø - 11    4      1Ø.     11.   Values
J     LINEAR COMBINATIONS WITH VALUES 11 - 12    5      11.     12.
```

FORM AD-433 (9-74)

Exhibit A26.--Recoding and display
(Part 1 of 2)

ABCDEFG IJ LMNOPQRSTUVWXYZ 123-56789 . &#=$%¢ ()*/.:<=>,-+

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PAGE 2 OF 2

SAMPLE RUN - LINEAR COMBINATION

BLOCK PUNCH

```
J  LINEAR COMBINATIONS WITH VALUES 12 - 13      6      12.
J  LINEAR COMBINATIONS WITH VALUES 13 - 14      7      13.
J  LINEAR COMBINATIONS WITH VALUES 14 - 16      8      14.
J  LINEAR COMBINATIONS WITH VALUES 16 OR GT     9      16.
R  C=POL]*2+[STIMBER]+[ASOILS]*3ELSE'0'; (Map Composition)       0
T  HI
N    (Option for numeric character output)
N   (Option for grey scale)   X
X
@FIN
```

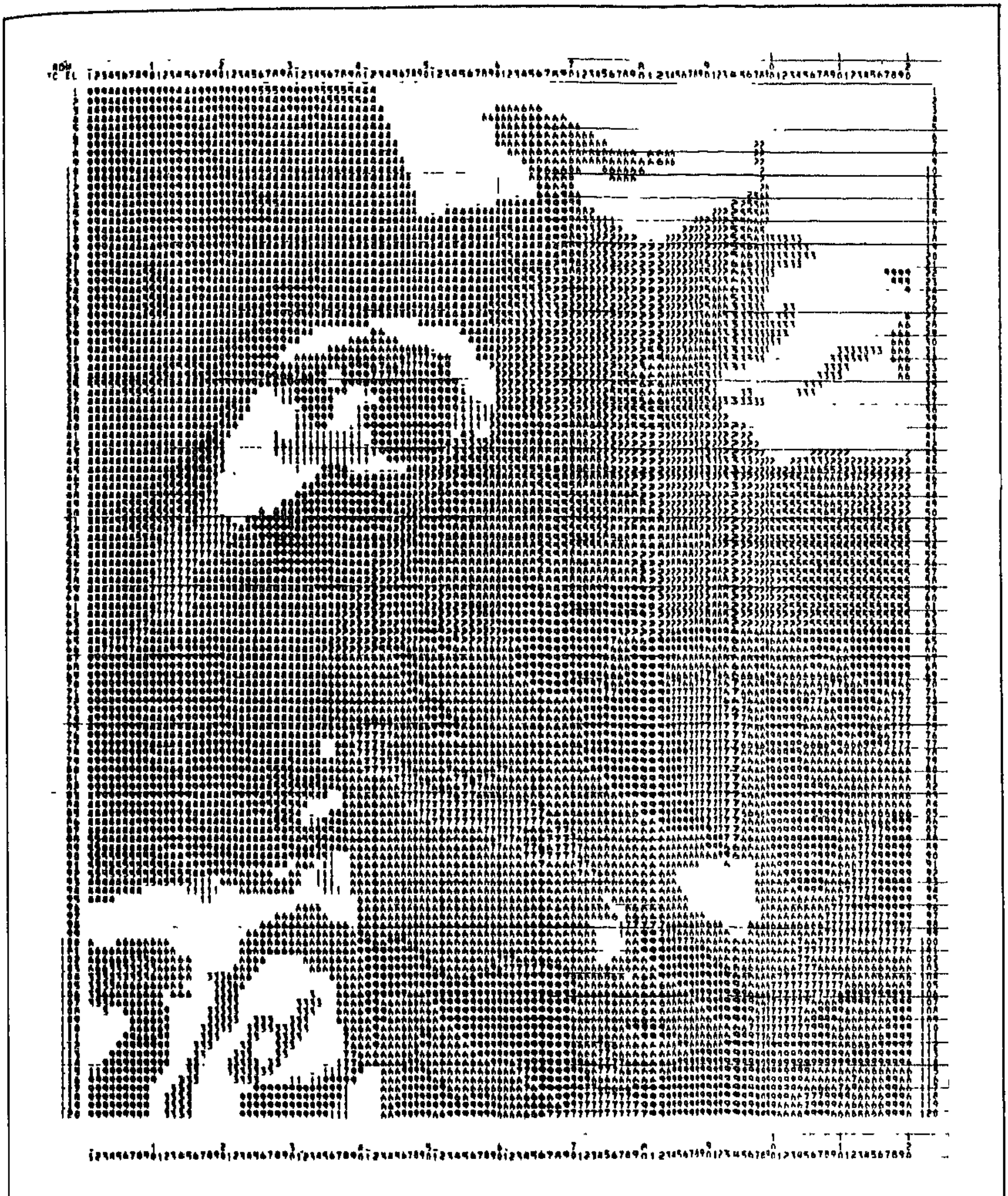


Exhibit A26.--Numeric display
(Part 2 of 2)

Exhibit A27.--Linear combination - grey scale display

d. Window Display

Often a multitude of sectors are stored on tape but only a few key positions might be needed for display. The W-Card is designed to selectively display portions of an area. A maximum of one sector can be requested for each W-Card. No boundaries may appear on a window display. You may elect to display either the original cell coded values or gray tone (numeric maps only). See Appendix A for a detailed explanation of the W-Card.

A user has determined that a display be produced of a specific area of interest within the study area. To obtain the sample map the following W-Card was submitted.

Col. 1	W	-	Input Card ID
Col. 3-5	1	-	Sector row that contains the upper left most cell of the window interest
Col. 6-8	1	-	Sector column
Col. 10-12	92	-	Element Row #
Col. 13-15	86	-	Element Column #
Col. 17-19	39	-	Number of rows to print starting at sector row 92
Col. 20-22	38	-	Number of columns to print starting at sector column 86
Col. 31		-	Suppresses asterisk

If the user wants to display the map in a gray tone see W-Card explanation in Appendix A (sample run, sample map, Exhibit A28).

Statistics cannot be generated for window area. This capability is for display only.

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890 =#$%¢'()*/:,<=>.,-+

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

PREPARED BY | PHONE | SYSTEM | PAGE OF
PROGRAM NAME | PROGRAM NO. | DATE
COMMENTS SAMPLE RUN - WINDOW DISPLAY

BLOCK PUNCH

```
@RUN
@ASG,A RID*GRID
@ASG,T RID*BMEAP2.,U9V,F04977
@USE 7,RID*BMRAP2
@XQT,OU RID*GRID.GRID
*
REFERENCE 7.223       6.533      44.0833     71.4166
A RIDS DEMO                                                      BENCHRAP
G C0018 .SOILS              1    1    1

                      WINDOW DISPLAY
                          SOILS
                       SCALE 1:31680

           A - 2                     K - 10
           B - 28                    L - 11
           C - 3                     M - 12
             ≡                         ≡
Dimension
 Col
8 (41)
0+7            ·(Suppress asterisk *)
```

FORM AD-633 (9-74)

Exhibit A28.--Window display
(Part 1 of 2)

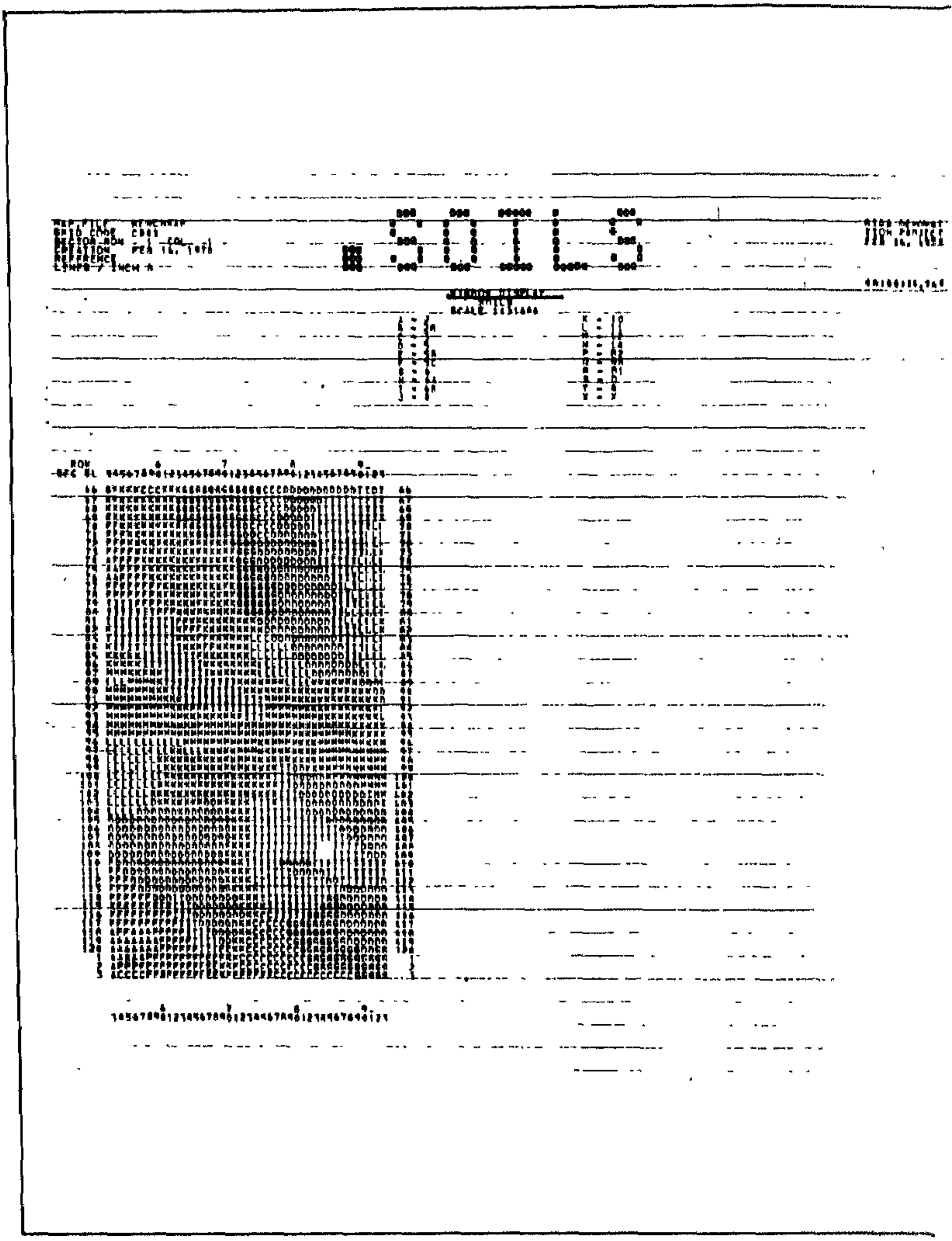


Exhibit A28.--Window display sample (Part 2 of 2)

e. Text Overlay

This routine provides the user with an option to annotate the map display. The text overlay procedure is generated through the use of the H-Card. See Appendix A for description and use of the R-Card (sample run, sample map, Exhibit A29).

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890 ¢"#$%¢'()*/:;<=>.,-+

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

PREPARED BY | PHONE NO. | SYSTEM | PAGE OF
PROGRAM NAME | PROGRAM NO | DATE
COMMENTS SAMPLE RUN - TEXT OVERLAY

BLOCK PUNCH

```
@RUN
@ASG,A RID*GRID.
@ASG,T RID*BMRAP2.,U9V,F04977
@USE 7,RID*BMRAP2
@XQT,OV RID*GRID.GRID
*
REFERENCE 7.223      6.533      44.0833    71.4166 -
A RIDS DEMO                                        BENCHRAP
G C0018  .SOILS          1  1  1
I
I                       TEXT OVERLAY
I                       SOILS OUTLINE
T                                              Row Col Length  Text
H    9 96  1 X             10 88 11 SAWYER ROCK     11 88 11 PICNIC AREA
H   15 109  8 PURCHASE     16 109  4 UNIT           19 56  1 X
H   20 53 10 MT.TREMONT    39 39  1 W               39 43 11 SAWYER POND
H   45 58 12 X OWLS CLIFF  57 112 10 X MTN PEAK     59 12  5 GREEN
T HI X
Z             ***       .        . . . . . . . . . . . . . . . . . .   .
X        Boundary outline          Surpressed symbols
@FIN
```

FORM AD-679

Exhibit A29.--Text overlaying
(Part 1 of 2)

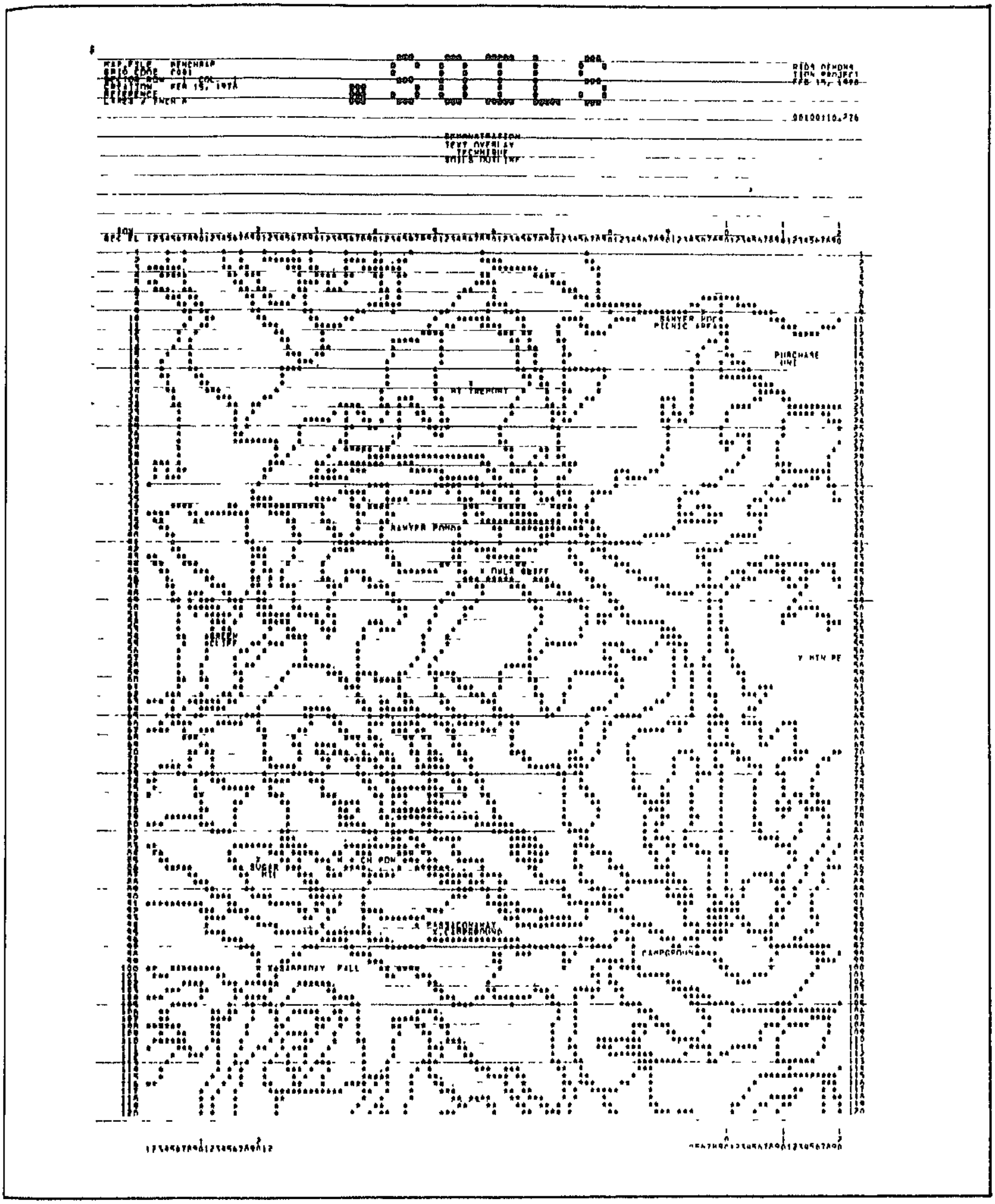


Exhibit A29.--Text overlay
(Part 2 of 2)

IV. COST ANALYSIS

The following representative costs and work units are based on the following: ASSUME 115200 ACRE STUDY AREA

2 Acre grid cell (.125" x .10")

240 rows x 240 columns (4 sectors)

(total cells 57600)

3 topics (POL, ELT, TM)

PHASE	ITEM	COMPUTER COST MATERIALS	LABOR HOURS
Determine Input Method	Decision to use Method I or II		.5
Define Study Area	Base Map		
	- Determine scale, boundary area cell size and shape		8
	- Delineate boundary		1
Data Format	Determine Topics and Values		2 hours p/topic
Data Base Drafting	Obtain Supplies		
	- Computer generated master grid	$2	.5
	- Coding grids (1 per topic)	$3 ea.	
	- Obtain ID Strips		
	Develop master grid p/sector		
	- Register grid p/topic		.25
	- Delineate boundary p/topic		1
	- Assign row/column p/topic		.5
	Prepare Code sheet for keypunching		
	- Record values on coding form (POL 3, ELT 15) (TM 17)		35
	- Keypunching $.10 p/card 240 cards p/sector p/topic	$24	13
Initial Run Passive	Obtain copy of data input for edit p/sector p/topic	$2	

PHASE	ITEM	COMPUTER COST MATERIALS	LABOR HOURS
Data Edit	Political topic p/sector		.25
	Ecological topic p/sector		1.75
	Timber p/sector		3.0
Data Correction	Keypunch $.10 p/card		
Verification	To assure that all data is clean		
Run-Passive	Obtain output for each topic by sector	$2.50 (4 sectors)	
Create Initial File-Active	Creates data file of topic for manipulation and storage (3 topics p/sector)	$2.50 (4 sectors)	
Verification File-Active	To assure that all data is topic for manipulation and storage (3 topics p/sector)	$2.50 (4 sectors)	
Data Map Options (batch mode)	Single topic p/sector	$2	.25
	Intersection p/sector	$2	.50
	Linear combination p/sector	$4	.50
	Window display p/sector	$1.75	.50
	Text overlay p/sector	$2	1.00
(Demand Mode)	Single topic p/sector	$6	.50
	Intersection	$7	.50

NOTE: All costs are based on Batch Mode using "N" priority unless noted otherwise.

PHASE	ITEM	COMPUTER COST MATERIALS	LABOR HOURS
Data Base Storage	Storage and costs		
	- Magnetic tape - p/tape p/month	$1	
	Accessing		
	- Copy tape to disc "P" priority (avg)	$3	.25
	- Receiving output	$1	.25
	- Save tape	$1	.25
	- Create tape "P" priority	$3	.25

SECTION B

This section is a description of the RID*POLY program. It is being prepared separately and will be included in the RIDS User's Guide as Section B.

TABLE OF CONTENTS

SECTION C

SECTION C

HANDLING DIGITIZED DATA

I. Data Sources Acceptable to RID*GRID

A. General Information

1. Sources

RID*GRID is capable of interfacing with the following sources of digitized data:

	File Class	Reference
(1)	GIRAS (Formerly LUDA)	See Appendix "A"
(2)	DIMECO (Census County Outline File)	See Appendix "A"
(3)	F-Cards	See Appendix "A"
(4)	COMLUP Formatted Data	See following pa
(5)	POLY Formatted Data	See Section
(6)	DMA Terrain Data Tapes	See Section
(7)	Other files, if correctly preprocessed	See Appendix "A"

Files in Class 1, 2, 4, 5, and 6 are preprocessed, off-line, into what is called "GRID-Standard-Format." The preprocesse data can then be mapped using GRID control statements. Data presented on F-Cards are processed immediately within GRID.

Data in other forms may be handled with a minimum of progran effort necessary to produce GRID-formatted files. A skeletc program is provided in the Reference.

The eventual coordinate system used for all GRID data is geographic (latitude, longitude); all coordinates must be

coordinates
transformed into geographic before mapping in the GRID System is possible. DIMECO and F-Card coordinates are already geographic, and the GIRAS, COMLUP, and POLY preprocessors perform the transformation for those files.

B. Digitized Features

RID accepts three types of digitized features:

1. Closed polygonal - e.g., physical land or surface features, census tracts, county boundaries.
2. Open polygonal (arcs) - Features which, at the scale of the source map, are one-dimensional, such as roads and stream beds.
3. Point or incidence data, e.g., population centroids, disease occurrences, etc.

C. Attributes

Quantitative data associated with polygons, arcs, or points are known as attributes. Unless only the boundary or extent of a digitized feature is of interest, these are what are to be mapped in GRID. All attribute values are stored as real ('floating point') numbers. Examples of attributes are population of census areas, average annual rainfall for a Region, vehicular density along traffic corridors, etc.

In case it is required that several attributes of a digitized area are to be mapped, GRID provides a convenient means to do so. A 'master map' is initially created from the polygonal data. Thereafter, all attributes may be mapped by association with the

cross-reference symbols of the 'master map.' A good example would be census information. A new 'master map' must be created each time a new scale is desired.

II. Structure of GRID-Standard-Files

There is one record for each feature. A record consists of a prefix followed by coordinates and attributes, and contains these data items:

1. 'Master Map' symbol. There is a one-to-one correspondence between these and each unique feature.

2. Feature Type.

   1 = Polygon

   2 = Arc

   3 = Point

3. Number of vertices, N. (polygons and arcs)

4,5. Interior point coordinates (geographic; polygons only)

6,7,8,9. Min longitude, Min latitude, Max longitude, Max latitude (polygons only)

The above nine items constitute the prefix.

10. Vertex coordinates (geographic)

    1, for a Point.

    N, for an Arc.

    N+1, for a Polygon where $vertex_{N+1}=vertex_1$

    Vertices are ordered either

    clockwise around the boun

11. Zero or more attribute values.

The number and order of these attribut

be represented exactly on the E-Card s

no attribute values exist in the file,

created, and no E-Cards are necessary;

a 'real-valued' map is to be created, these values must be scaled or otherwise transformed via J-Cards or auto-scaling on the Q-Card in order to produce a cellular map for display. A given 'real-valued' map may be transformed into any other type via R-Cards.

III. Processing "COMLUP-Formatted" Data

As was mentioned before, COMLUP project data tapes must be pre-processed by an off-line program before they may be used as input to GRID. (In addition, the data must be closure-edited by the COMLUP system). Fiducial or registration points are input in a way similar to that described in the previous section. Also, the user may elect to process only a subset of the features in the file, based on their attribute values, by either excepting a few values from the whole or by explicitly listing those values he wishes to include. Attribute selection is done via:

NAMELIST/ATSLCT/ATTRIB

where ATTRIB is an array which will ist either the attributes to be included or those to be rejected.

The COMLUP Preprocessor can accept data either from closure-edited COMLUP tapes or from SDF card-image files created from those tapes. The EXEC-8 runstreams for the two types of input are slightly different.

Often data is digitized from several separate map sheets. A set of fiducial coordinates is required for each sheet.

A. Runstream for Tape Input

```
@ASG,T A$A.,F///n                 Temporary
@ASG,A RID*GRID                   GRID Program File
@ASG,THEIJ A,16,reel1/.../reelN Edited tapes (one per sheet)
@ASG,T B,U9V                      Preprocessed file (save reel)
@XQT,OU RID*GRID.PREPRC/COMLUP
 $ATSLCT ATTRIB = -1, -3, -7, 97*0
 $END
 $FIDUC
             Fiducials for 1st map sheet
 $END

 $FIDUC
             Fiducials for Nth map sheet
 $END
```

In the example the user is excluding attributes 1, 3, and 7 from processing.

B. Runstream for Card-Image Input

```
@ASG,T A$A.,F///n
@ASG,A RID*GRID
@ASG,A Sheet 1                   File containing arcs of maps
     .                                         .
     .                                         .
     .                                         .
@ASG,A Sheet N                   File containing arcs of maps

@ASG,T B,U9V,reel #              Preprocessed file

@XQT,OU RID*GRID.PREPRC/COMLUP

 $ATSLCT

 $END

 $FIDUC
                Fiducials for Sheet 1
 $END

@ADD,E Sheet 1


 $FIDUC
                Fiducials for Sheet N
 $END

@ADD,E SheetN
```

In this example, the user admits all attribute values for processing. NOTE: The preprocessed output file, Unit B, may be assigned to mass storage rather than tape. GRID will accept either.

Presently, the identical point tolerance for COMLUP data is set at .067". The user may alter this by specifying a value for TO in the NAMELIST, FIDUC.

C. Error Messages

'ARCS MISSING FROM POLYGON, XXXX, REEL X'

The identified polygon cannot be chained. Lowering the equal point tolerance from the default value may help.

'DANGLING ARC'

An arc whose overall length is less than the equal point tolerance has been discovered and is not necessary to close the polygon.

'INVALID ENTRIES FOR ORIENTATION VECTORS'

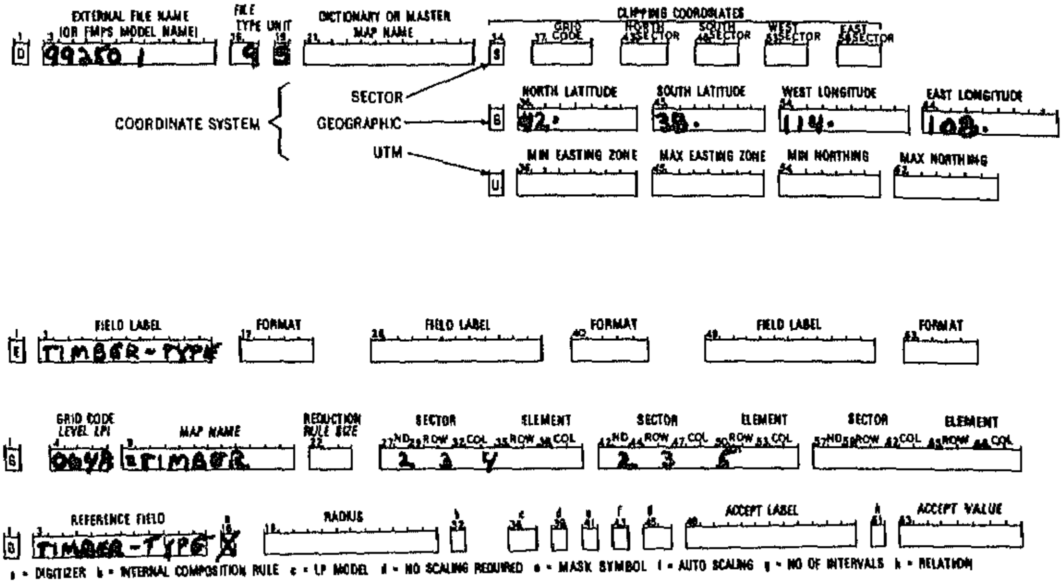
See Appendix "A" D-Card External Data File

'MISSING OR INVALID FIDUCIAL COORDINATES'

Three pairs of coordinates must be present. Digitized coordinates must not be negative.

D. GRID Runstream

In order to identify the COMLUP project tape, the preprocessor affixes the project number in the header of the standardized file. This project number must be referenced on the D-card's external file name field. There is only one attribute on a COMLUP file (e.g., forest-type), and so only one is mentioned on the E-Card. The clipping coordinates entered on the D-Card may be more restrictive than either the source map boundary or the coordinates defined by the G-Card sectors.



The COMLUP preprocessor prints a list of 3-character master m
cross-reference symbols. A master map may be created from th
preprocessed file; no reference field is necessary on the Q-C
in this case. The user may subsequently use the master map t
create new maps from other data.

SECTION D

PROCESSING POLYGON DIGITIZED DATA

IN GRID SYSTEM

EXHIBIT	DESCRIPTION
D1	Runstream - Transmit Data to FCCC (Sample Output)
D2	Runstream - RID*PLOT.PLOT (Sample Output)
D3	Runstream - RID*GRID. PREPRC/PLOT (Sample Output)
D4	Runstream - RID*GRID.GRID (Coding Form)
D5	Runstream - RID*GRID.GRID (Sample Output)

SECTION D

Processing Polygon Digitized Through the RID*GRID System

I. GENERAL INFORMATION

The RID System is able to accept polygon digitized data for input through the PLOT program or converted for use with the grid system.

A. Overview

The polygons are digitized for input to the PLOT program, RIDS*PLOTS. The data is then edited using the edit routine RIDS*PLOTS.EDIT, to insure that all polygons are closed. Then a verification plot is obtained using the RIDS*PLOTS.PLOT routine. The plotted output represents the polygons as they were digitized. If errors are encountered in the EDIT or PLOT outputs and changes are to be made to the data file the UNIVAC EXEC 8 editor is used to accomplish this task. When you are satisfied with the data file it is then saved. At this point you convert the data to grid for processing through the grid system.

To process through the grid system you must input your clean polygon data file through a conversion program called RID*GRID.PREPRC/PLOT. This program will convert polygon data to a grid file for input to the RIDS grid system. The next step is then to input the converted file into the grid system, RID*GRID.GRID for file creation, manipulation and output. The procedures for executing this task are discussed in Section A.

B. Operating Procedure

The following procedure is recommended for processing the pol digitized data, converting to grid, manipulation and obtainin grid outputs with statistical data.

When digitizing it is important to remember that the digitize data must be recorded in PLOT digitized format.

1. Digitize Polygons

CARD FORMAT 1: File Header Record

COLUMN	FORMAT	DESCRIPTION
1 - 2	12	Forest number
3 - 6	14	Compartment number
7 - 8	12	Layer number
9 - 15	F7.3	Acreage factor. This number is used to convert the computed area of each polygon to acres.
16 - 80		Not used

CARD FORMAT 2: Polygon Header Record

COLUMN	FORMAT	DESCRIPTION
1 - 6	6A1	Polygon label
7 - 12		Not used
13 - 18	I6	X-coordinate of interior point
19 - 24	I6	Y-coordinate of interior point
25 - 30	I6	X-coordinate of a vertex of the polygon
31 - 36	I6	Y-coordinate of a vertex of the polygon The X and Y coordinate of each unit are assumed to be in hundredths of an inch for all computation and plotting.
37 - 42	I6	X2
43 - 48	I6	Y2
49 - 54	I6	X3
55 - 60	I6	Y3
61 - 66	I6	X4
67 - 72	I6	Y4
73 - 80		Not used

CARD FORMAT 3: Pol

COLUMN	FORMAT	DESCRITION
1 - 6	I6	X1
7 - 12	I6	Y1
13 - 18	I6	X2
19 - 24	I6	Y2
25 - 30	I6	X3
31 - 36	I6	Y3
37 - 42	I6	X4
43 - 48	I6	Y4
49 - 54	I6	X5
55 - 60	I6	Y5
61 - 66	I6	X6
67 - 72	I6	Y6
73 - 80		Not used

2. Transmit Data Tape to FCCC

SAMPLE RUNSTREAM

```
@RUN
@ASG,CP GM*DIGIT.
@DATA,IL GM*DIGIT.
//JOB TPLN
* TAPE TO LINE
//UTL TC,FF,A=(8Ø,8Ø), B=(8Ø,8Ø), KY,IR,LN
//ASSIGN I=(11),Ø=(2Ø)
//EXEC
//END
```

Exec 8 command (@RUN, @ASG, @DATA lines)

Data 1ØØ command (// lines)

SAMPLE OUTPUT

(SEE EXHIBIT D1)

3. Execute RIDS*PLOTS.EDIT to insure that all polygons are closed.

SAMPLE RUNSTREAM

```
@RUN
@ASG,A RIDS*PLOTS.
@ASG,A GM*DIGIT.
@USE 8,GM*DIGIT.
@ASG,CP GM*DIGITED.
@USE 9. GM*DIGITED.
@XQT RIDS*PLOTS.EDIT
```

USER NAMED

****PLOT EDITOR PROGRAM

FOREST 12 COMPARTMENT 1000 LAYER 1 ACRE FACTOR 160,000

ID	LABEL	PTS	ACRES					
1	1	33	2191.061	5763	637	12062	5737	[illegible]
2	2	31	2035.045	5325	4917	11669	3612	[illegible]
3	3	25	5333.279	5592	5569	13543	13341	[illegible]
4	4	29	2353.401	3349	3892	16154	14620	[illegible]
5	5	59	1749.743	11295	4701	15964	9559	[illegible]
6	6	62	3789.474	11540	-164	21095	5469	[illegible]
7	7	104	1959.355	13332	2961	19991	4324	[illegible]
8	8	39	944.124	13481	3175	13410	5300	[illegible]
9	9	37	1243.133	13030	4315	17044	9403	[illegible]
10	10	63	1491.752	14905	5073	18651	10311	[illegible]
Unique Polygon ID (System Generated)	User Polygon ID	Pts in Bdry	Area of Polygon	MAX X	MIN X	MAX Y	MIN Y	

PROPER EXIT

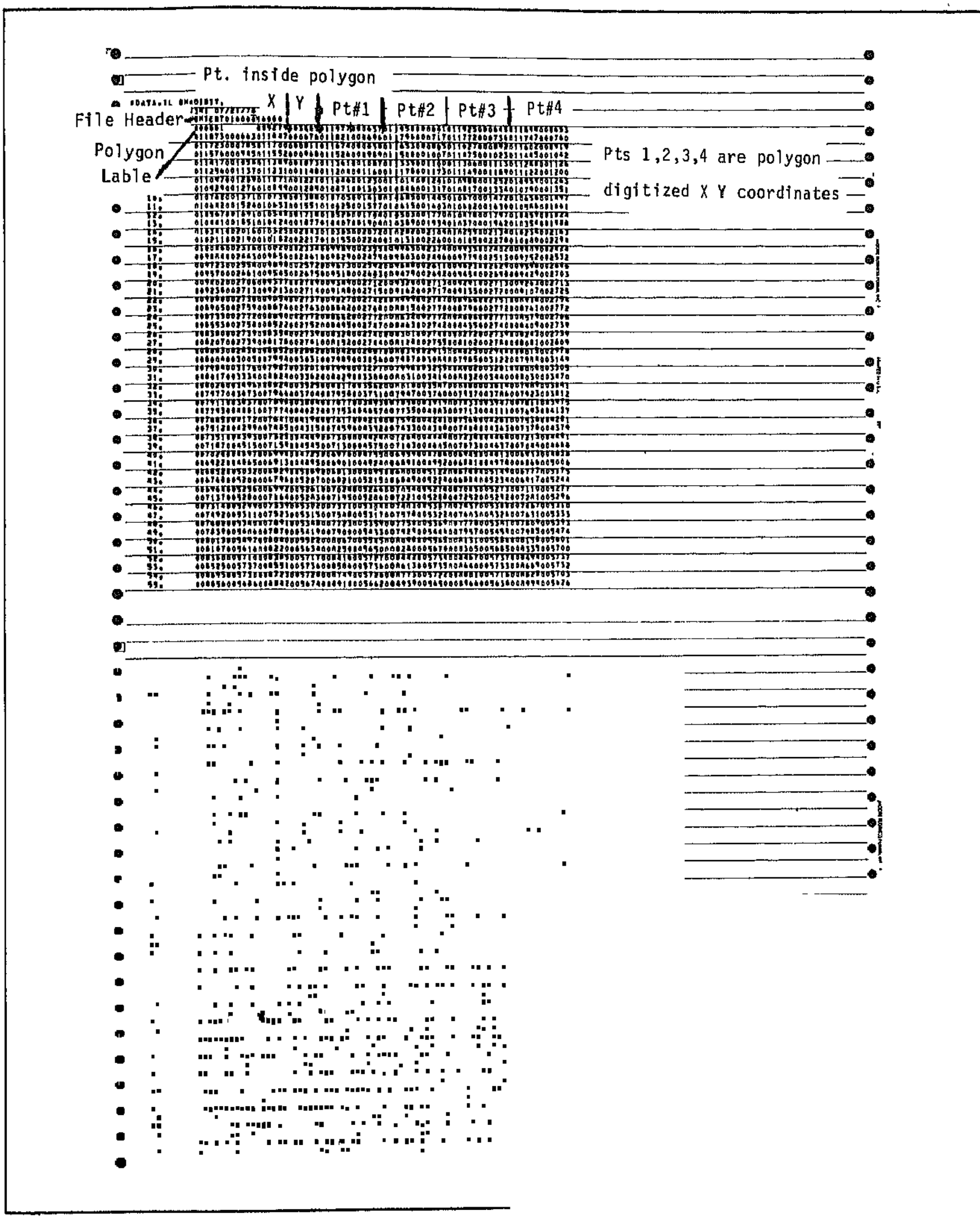


Exhibit D1.--Sampl

a. Minor corrections are done with the UNIVAC editor.

b. Major corrections must be redigitized and reprocessed through the EDIT Program. See Appendix C or additional information.

4. Execute RID*PLOT.PLOT to obtain verification plot.

SAMPLE RUNSTREAM

```
@RUN
@ASG,A RIDS*PLOTS.
@ASG,A GM*DIGITED.   }  USER NAMED FILES
@USE 1Ø,GM*DIGITED.  }
@XQT RIDS*PLOTS.PLOT
```

PLOT PLOTTING PROGRAM

```
ENTER MINIMUM SIZE POLYGON TO BE PLOTTED...USE DECIMAL
 .Ø5
ENTER SIZE CHARACTERS DESIRED IN INCHES FOR POLYGON LABELS
ON PLOT...USE DECIMAL
 .1
ENTER NUMBER OF LAYERS TO BE PLOTTED
 1
ENTER PLOT IDENTIFICATION-36 CHARACTERS-MAX
SAMPLE PLOT GRN MTN TEST
ENTER PLOT MAILING OR HANDLING INSTRUCTIONS
>ROGER PELLETIER WO
DO YOU WANT TO SCALE YOUR PLOT?
>NO
LIST OF DELETED POLYGONS
 IDS     LABELS
ENTER NUMBER OF PENS
>1
ENTER COLOR OF INK
>BLACK
ENTER TYPE OF PAPER
>GRAPH
ENTER SITE ID TO WHICH YOU WISH TO SYM PLOT FILE
>FCRØ33  (YOUR SITE ID)
PLOT FILE WILL BE SYMED TO SITE FCRØ33 (YOUR SITE ID)
* * END OF PLOT PROGRAM * *
>@FIN
```

(See Exhibit D2 for Sample Plot Output)

5. Save output file from RIDS*PLOTS.EDIT This is a clean copy of your raw data.

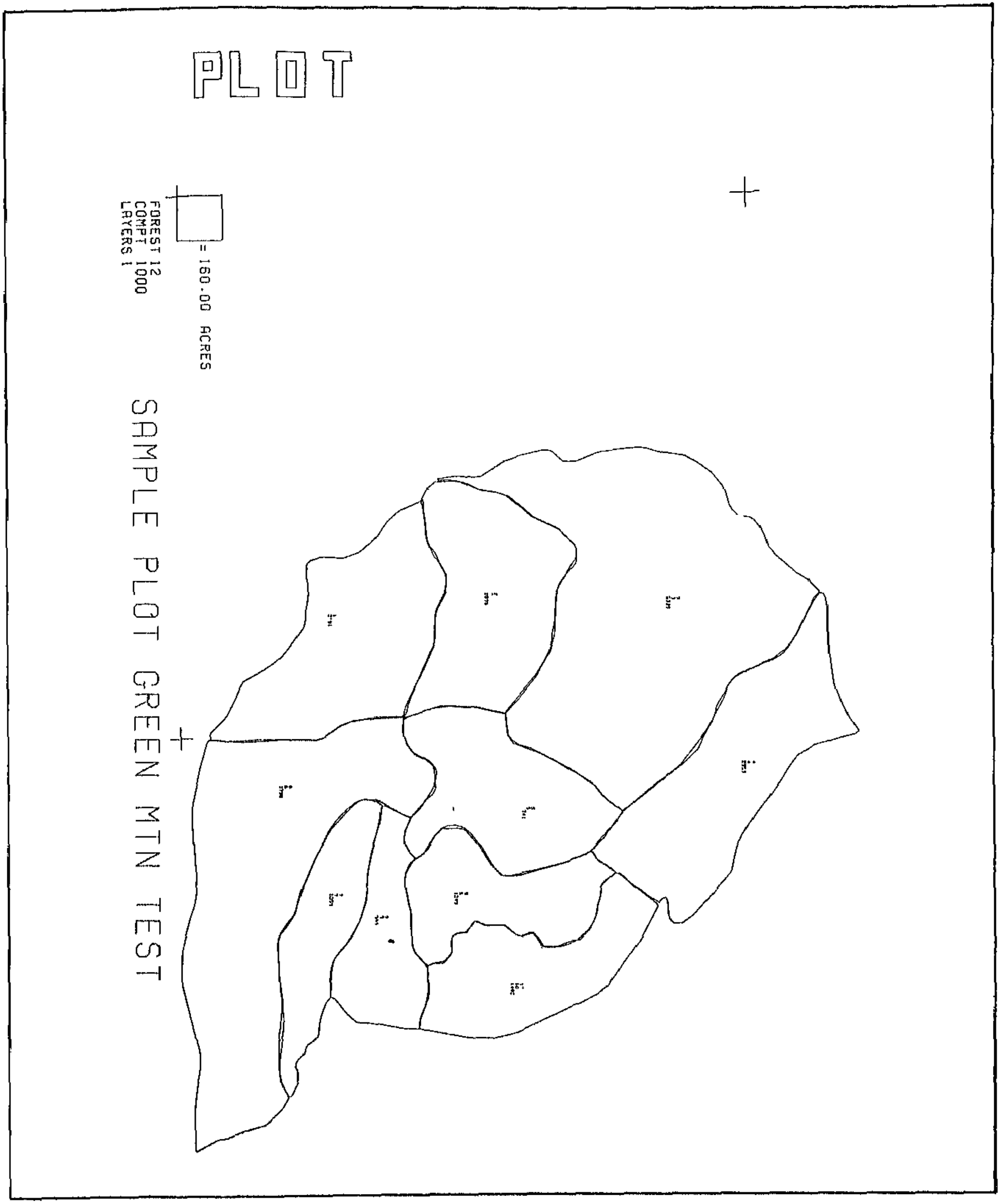


*Exhibit D2.---RID*PLOT.PLOT - sample output*

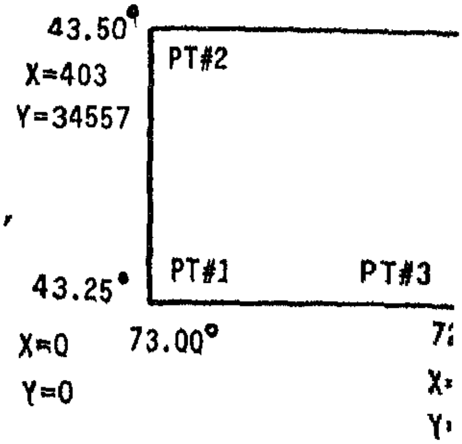
6. Execute RID*GRID.PREPRC/PLOT, this program converts the polygon plot file to a grid file for input to the grid system, RID*GRID.

   a. Step 1, in Demand Mode--Create a runstream with the necessary commands to convert the PLOT file.

STEP 1 - CREATE THE RUNSTREAM

<u>PREPRC/PLOT</u>

```
@RUN  (YOUR RUN CARD)
@ASG,CP ROGER*P.  (ASSIGN A FILE NAME TO THE RUNSTREAM YOU ARE ABO
                   TO GENERATE).
@ED,I ROGER*P.  (FILE NAME ASSIGNED ABOVE)
o
o
o
INPUT  (CARRIAGE RETURN)
EDIT
0:  I  @RUN,L XXXXXX,1111111111,AAA,1,50      (YOUR RUN-CARD).
1:  I  @SYM,U PRINT$,,UCR281                  (YOUR SITE-ID).
2:  I  @ASG,A  RID*GRID.
3:  I  @ASG,A  RHP*DIGITED.         (YOUR INPUT FILENAME).
4:  I  @ASG,A  RHP*DIGRID.          (YOUR OUTPUT FILENAME).
5:  I  @USE  B.,RHP*DIGRID.
6:  I  @XQT  RID*GRID.PREPRC/PLOT
7:  I   $ATSLCT
9:  I   $END
10: I   $FIDUC
11: I   LNG1=73.00,LAT1=43.25,
12: I   LNG2=73.00,LAT2=43.50,
13: I   LNG3=72.75,LAT3=43.25,
14: I   IX1=0,IY1=0, IX2=403,IY2=34557,
15: I   IX3=25185,IY3=0,
16: I   $END
17: I  @ADD,EP  RHP*DIGITED.
18: I  @FIN
19: EXIT
@FIN
```



   b. @START your runstream.

STEP 2 - SUBMIT THE RUN FOR BATCH PROCESSING

```
@RUN  (YOUR RUN CARD)
@ASG,A ROGER*P.  (ASSIGN THE NAME OF THE RUNSTREAM YOU GENERATED
                  IN STEP 1)
@START ROGER*P.  (FILE NAME ASSIGNED ABOVE)
@FIN
(SEE EXHIBIT D3 SAMPLE OUTPUT)
```

7. Execute RID*GRID.GRID in a passive mode to obtain verification grid conversion output (Batch Mode).

   Step 1 -- Create a runstream with the necessary commands to execute RID*GRID.GRID.

STEP 1 - CREATE THE RUNSTREAM

```
@RUN  (YOUR RUN CARD)
@ASG,CP  (ASSIGN A FILE NAME TO THE RUNSTREAM YOU ARE ABOUT TO
          GENERATE)
@ED,I  (FILE NAME ASSIGNED ABOVE)
o
o
o
INPUT (CARRIAGE RETURN)
EDIT
0:   I @RUN  (TYPE IN RUN CARD FOR YOUR BATCH RUNSTREAM)
1:   I @SYM PRINT$,,  (YOUR SITE ID)
2:   I @ASG,A RID*GRID.
3:   I @ASG,A (RID STANDARD OUTPUT FILE CREATED WITH PREPRC/PLOT)
4:   I @USE B.,  (RID STANDARD OUTPUT FILE)
5:   I @ASG,T.,U9V (ASSIGN A TEMPORARY OUTPUT FILE }  ACTIVE MODE
6:   I @USE 9.,  (OUTPUT FILE ASSIGNED ABOVE)      }  TO CREATE MAP FILE
7:   I @XQT,S RID*GRID.GRID
8:   I *
9:   I A
10:  I D                (See Exhibit D4, Sample Data Entry on coding
11:  I E                 form)
12:  I G                (See Appendix "A" for  description of input
13:  I Q                 form)
14:  I T
15:  I Z
16:  I *
17:  I @FIN
18:  EXIT
@FIN
```

```
@XQT,OU T
 $FIDUC
 MINLAT   =      .43250000E+02
 MAXLAT   =      .43500000E+02
 MINLON   =      .72750000E+02
 MAXLON   =      .73000000E+02
 LNG1     =      .73000000E+02
 LAT1     =      .43250000E+02
 LNG2     =      .73000000E+02
 LAT2     =      .43500000E+02
 LNG3     =      .72750000E+02
 LAT3     =      .43250000E+02
 IX1      =                 +0
 IY1      =                 +0
 IX2      =               +403
 IY2      =             +34557
 IX3      =             +25185
 IY3      =                 +0
 ORNTX    =                 +0,              +0
 ORNTY    =                 +0,              +0
 TOLER    =      .67000000E-01


$END
POLYGON LABEL:      8 8     POLYGON HEADER:    H--     1    88
    72.8425      43.2829      72.8178      43.2741      72.8666     43.289
POLYGON LABEL:      7 7     POLYGON HEADER:    G--     1   103
    72.8474      43.2758      72.8030      43.2660      72.8680     43.282
POLYGON LABEL:      9 9     POLYGON HEADER:    I--     1    86
    72.8477      43.2951      72.8318      43.2860      72.8617     43.319
POLYGON LABEL:     10 10    POLYGON HEADER:    J--     1    62
    72.8278      43.3040      72.8160      43.2880      72.8518     43.326
POLYGON LABEL:      5 5     POLYGON HEADER:    E--     1    59
    72.8663      43.3059      72.8515      43.2856      72.8885     43.320
POLYGON LABEL:      2 2     POLYGON HEADER:    B--     1    80
    72.9133      43.2998      72.8862      43.2854      72.9378     43.313




POLYGON LABEL:      1 1     POLYGON HEADER:    A--     1    82
    72.9083      43.2754      72.8809      43.2552      72.9329     43.292
POLYGON LABEL:      4 4     POLYGON HEADER:    D--     1    79
    72.8766      43.3403      72.8412      43.3151      72.9132     43.357
POLYGON LABEL:      6 6     POLYGON HEADER:    F--     1   161
    72.8709      43.2679      72.7913      43.2498      72.8855     43.291
POLYGON LABEL:      3 3     POLYGON HEADER:    C--     1    94
    72.9126      43.3284      72.8660      43.2908      72.9451     43.351
TOTAL NUMBER OF POLYGONS PROCESSED:       10

@FIN
```

*Exhibit D3.--RID*GRID.PREPRC/PLOT - sample output*

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890 $'()*/;<=>.,-+

U.S. DEPARTMENT OF AGRICULTURE
FORTRAN CODING

```
@RUN
@ASG,A RID*GRID.
@ASG,A UBBENS*DIGRAP.
@USE B., UBBENS*DIGRAP
@XQT,S RID*GRID.GRID
*
A PLOT DEMO                                          X GM-TM
D 121ØØØ 1    11 B          6 43.5Ø   43.25   73.ØØ   72.75
E DIGRAP
G CØØ4B #GM-TM           1 39221
Q          X
T HI X                                          )))
Z
*
@FIN
```

Exhibit D4.--Sample data entry coding form

b. @START your runstream.

STEP 2 - SUBMIT THE RUN FOR BATCH PROCESSING

1. @RUN (YOUR RUN CARD)
2. @ASG,A (ASSIGN THE NAME OF THE RUNSTREAM YOU GENERATED IN STEP
3. @START (FILE NAME ASSIGNED ABOVE)
4. @FIN

(See Exhibit D5 Sample Output)

8. Execute 7 above again only this time in an active mode to create a grid map file.

9. Data Manipulation is the same as RID*GRID. See Section A for data manipulation procedures once file is created.

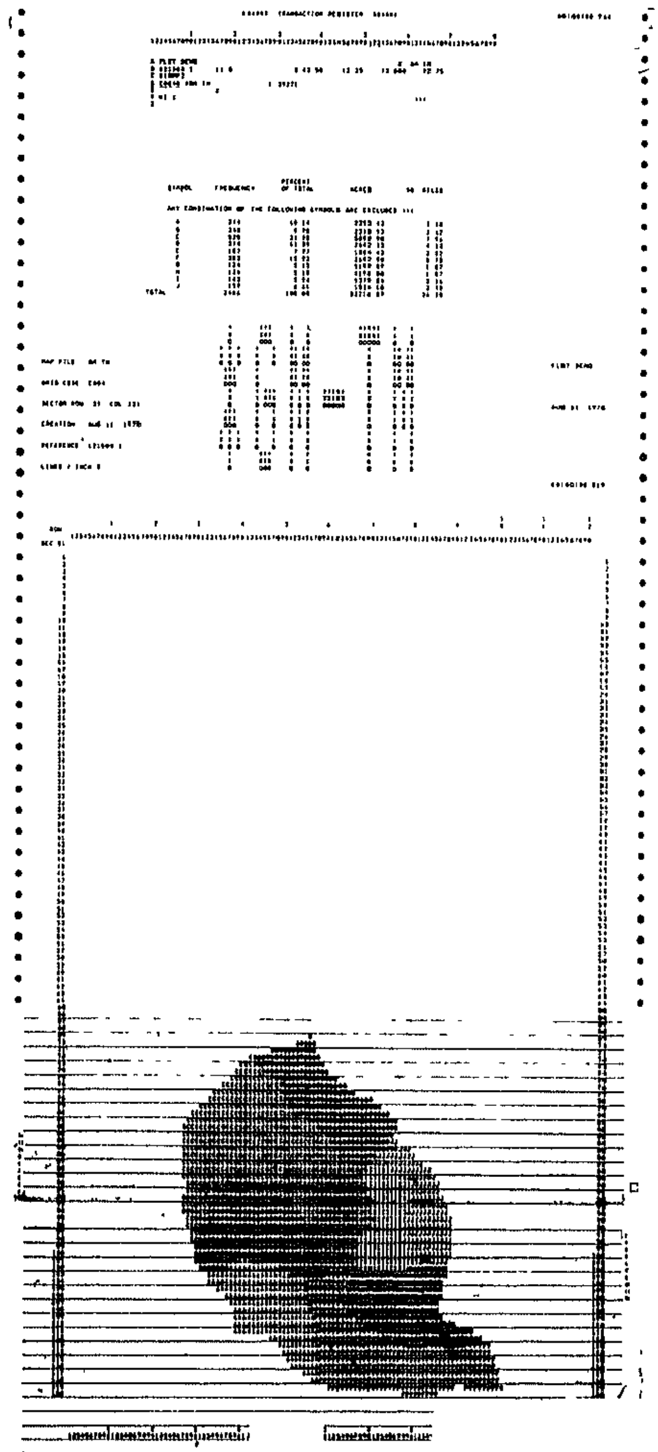


*Exhibit D5.--RID*GRID.GRID - sample output*

II. COST ANALYSIS

The following representative costs and work units are based on the following:

Study Area equal to a 7 1/2 minute USGS quadrangle at a scale of 1:24,0

Layers - Political (14 polygons)
Ecological Land Types (145 polygons)
Timber (297 polygons)

Work Unit Costs - GS-5 Step 1 = $5.05 p/hr.

A. Digitizing --

Layer	Work Unit	Cost
Political	1.05 hrs	$ 5.30
Ecological	4.08 hrs	20.60
Timber	4.30 hrs	21.72
TOTALS	9.43 hrs	$47.62

B. Input and Editing -- (See paragraph D, Section B for detailed cost analysis.) Includes transmitting data to FCCC, executing .EDIT and .PLOT programs and use of the UNIVAC Exec-8 editor in Demand Mode.

	Costs		
Layer	Work Unit		Computer
Political	2.08 hrs	$10.50	$ 10.56
Ecological	2.45 hrs	12.37	83.65
Timber	5.14 hrs	25.96	157.60
TOTALS	9.67 hrs	$48.83	$252.01 (De

C. Execute RID*GRID.PREPRC/PLOT to convert polygon data.

Cost approximately $.02 p/polygon, "N" priority, batch mode.

Political	$ .28
Ecological	2.90
Timber	5.94
TOTAL	$9.12

D. Execute RID*GRID.GRID (Passive Mode).

1 Sector   3 Topics $.60

E. Execute RID*GRID.GRID (Active Mode).

1 Sector   3 Topics $.60

Note the following is a comparison summary cost between the two methods of inputting data to the GRID System.

INPUT COST ANALYSIS

HAND CODING METHOD

Hand Coding "Work Unit" Cost	$ 177.55	
Keypunching and Verification (930 Cards)	93.00	
Input and Editing "Work Unit" Cost	47.07	
Input and Editing "Computer" Cost	24.20	(N-Priority)
TOTAL	$ 341.82	

$341.82/3 Layers = 113.94 or $114.00 per layer

DIGITIZER METHOD

Digitizing "Work Unit" Cost	$ 47.62	
Input and Editing "Work Unit" Cost	48.83	
Input and Editing "Computer" Cost	252.01	(Demand)
TOTAL	$348.46	

348.46/3 layers = $116.15 or $116.00 per layer

SECTION E

SLOPE AND ASPECT MAPS

SECTION E

CREATION OF SLOPE AND ASPECT ZONE MAPS

I. OVERVIEW

An interface is available so that slope and aspect zone maps produced by the Forest Service Topographic Analysis System (TOPAS) can be entered into the Resource Information Display System (RID*GRID). Once in GRID, all of the capabilities of the GRID system can be used; such as combining with other maps, acreage and statistics, display options, etc.

Accuracy of slopes and aspect are limited by the 1:250,000 scale of the original maps. If every elevation point is utilized the map area is equivalent to a 3.75 x 3.75 minute quad. Limitations in the TOPAS system also affect accuracy. If 7 1/2' quads are used, every second elevation point is utilized; if 15' quads are used, every fourth elevation point can be used and for 30' quads, every sixteenth elevation point. Therefore, original inaccuracies from working with a very small scale map are compounded if the user desires outputs larger than 7 1/2' quads. As outputs in GRID can be displayed at any size, the user should be cautious ir
still related to the original 1:250,00
that TOPAS is not sufficiently accur

Most operations are more fully expla
TOPAS Users Guides. Only references
here in describing the sequence of op
assumes that users are familiar with

SECTION E

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Accuracy of slopes and aspect are limited by the 1:250,000 scale of the original maps. If every elevation point is utilized the map area is equivalent to a 3.75 x 3.75 minute quad. Limitations in the TOPAS system also affect accuracy. If 7 1/2' quads are used, every second elevation point is utilized; if 15' quads are used, every fourth elevation point can be used and for 30' quads, every sixteenth elevation point. Therefore, original inaccuracies from working with a very small scale map are compounded if the user desires outputs larger than 7 1/2' quads. As outputs in GRID can be displayed at any size, the user should be cautious in realizing that accuracy is still related to the original 1:250,000 scale. Many users have found that TOPAS is not sufficiently accurate to meet their needs.

Most operations are more fully explained in either the RIDS or the TOPAS Users Guides. Only references to these documents will be used here in describing the sequence of operations. This brief description assumes that users are familiar with both RIDS and TOPAS processes.

II. DESCRIPTION

1. NOTE: Only slope zone and aspect products of ZONIT are suitable for input to the GRID system (See Exhibit E1).

2. Procurement of DMA data tapes is covered in Chapter II of the TOPAS Users Guide. Notice if additional tapes are purchased, be sure they are 9-track, 1600 BPI. A DMA tapes selector program called PELLE*DMASORT.LIST can be utilized to determine if an individual tape is available from the DMA Tapes Data File. See Exhibit E2 for instructions to execute this program.

3. Process each tape file through COPYNCIC. Obtain instructions for doing this by the following computer commands (either demand or batch):

```
@ADD TØPAS*PGM.COPYNCIC/DOCIN
@EOF
```

4. After processing through COPYNCIC, save the tape and send the required documentation to WO Geometronics, for updating the library of DMA tapes.

   NOTE: COPYNCIC should be run on P priority with allowance of 10 minutes CPU time. Cost at this priority will be about $40.0 for each execution.

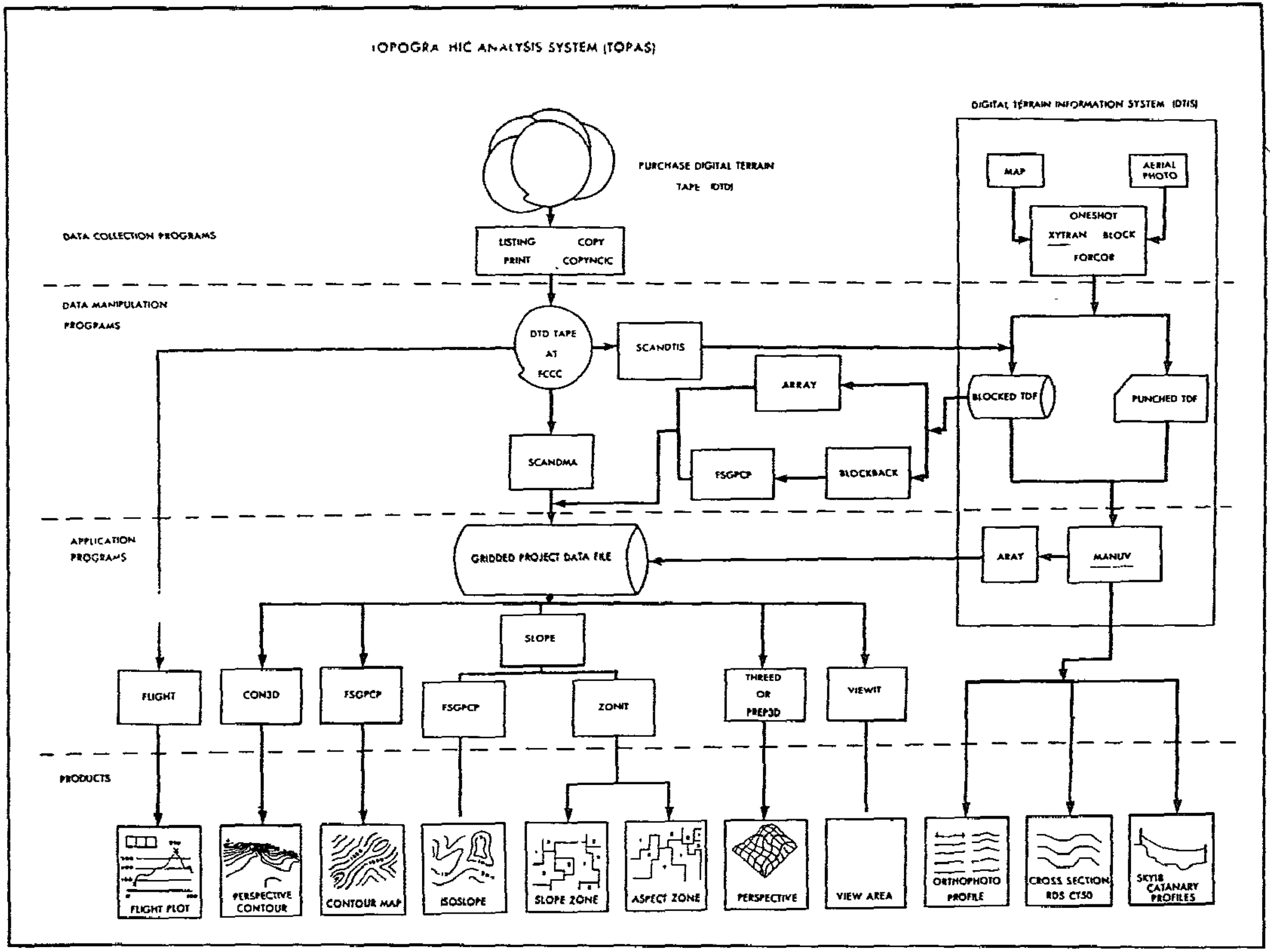


Exhibit E1.--Topographic analysis system (TOPAS)

A procedure has been developed to allow users to select individual sheet listings from the DMA Tapes Data File. The procedure has been designed to function primarily in the interactive mode; it may be activated by using identical control statements in the batch environment.

INVOKING THE PROCEDURE

The basic format of control statements to generate a listing is as follows:

```
@RUN RUNID, ACCT NO, PROJ
@@TTY W,132 or @@TTY W,80
```

For demand terminal operations only. This allows data to be printed out on a single line.

```
@ ASG, A  PELLE*DMASORT.
@ ASG, A  RIDS*DMATAPES.
@ USE 10, RIDS*DMATAPES.
@ XQT PELLE*DMASORT.LIST
```

At this point terminal will print out ENTER Ø FOR COMPLETE LISTING OR 1 FOR SPECIFIC SHEET

User will enter Ø or 1 on terminal
If Ø is selected entire DMATAPES data will be printed

If 1 is selected terminal will print out

ENTER SHEET NAME

User will enter sheet name.

Terminal will then write out

ENTER SHEET HALF

User will enter sheet half.

Then the program will search and print out the data pertaining to the selected sheet. If selected sheet is not on file, terminal will print out SHEET NOT FOUND and ENTER SHEET NAME.

@ FIN to terminate program.

@@ TERM to terminate terminal operation.

Exhibit E2.--DMA tapes selection program (Part 1 of 2)

For Batch Runs use the following:

<u>For complete listing</u>

```
@ RUN
@ ASG, A  PELLE*DMASORT.
@ ASG, A  RIDS*DMATAPES.
@ USE  10, RIDS*DMATAPES.
@ XQT  PELLE*DMASORT.LIST
0  Zero in Card Column 1 will give a complete listing
@ FIN
```

<u>For search of 1 DMA Tape</u>

```
@ RUN
@ ASG, A  PELLE*DMASORT.
@ ASG, A RIDS*DMATAPES.
@ USE 10, RIDS*DMATAPES.
@ XQT  PELLE*DMASORT.LIST

1 in Card Column 1 will give you a search for specific tape.
LOVELOCK  Sheet name of tape wanted start in Card Column 1.
EAST  Sheet half of tape wanted start in Card Column 1.
@ FIN
```

Be sure to spell the sheet name exactly as they are on the sheet index.

There will be approximately 100 pages in a complete listing.

Exhibit E2.--DMA tapes selection program
(Part 1 of 2 continued)

SAMPLE RUNSTREAM DMA TAPE SEARCH

```
*UNIVAC 1100 OPERATING SYSTEM  VER. 32-R2-0E     (RSI)*
>@RUN W51F61,[redacted],ROGER
DATE: 081778  TIME: 051706
The subject file,  BROADCASTS, has been updated as of 08/15/78  08:17:37
>@@TTY W,132
>
-@@COMPLETE
@ASG,A PELLE*DMASORT.
READY
>@ASG,A RIDS*DMATAPES.
READY
>@USE 10, RIDS*DMATAPES
READY
>@XQT PELLE*DMASORT.LIST
 ENTER 0 FOR COMPLETE LISTING OR 1 FOR SPECIFIC SHEET
>1
 ENTER SHEET NAME
 GLEN FALLS
 ENTER SHEET HALF
>EAST

 -----------------------------------------------------------------------------------------
 250 SHEET       DMA SHEET HALF USER TAPE        STATE SW CORNER TAPE LABL
    NAME           NUMBER            NUMBER
 GLEN FALLS      NK-18-03  EAST F02975              VT    43    73 UFDM*K1802

    98    18 1384    26    98 1759 1361 17/8    43    73
  SWX   SWY   SEX   SEY   NWX   NWY   NEX   NEY   LAT LONG
 -----------------------------------------------------------------------------------------
 ENTER SHEET NAME
>@FIN
```

E2.--DMA tapes selection program - sample runstrea
(Part 2 of 2)

5. Data obtained from printfile in running COPYNCIC, or PELLE*DMASORT.LIST (Exhibit E2-2) is utilized to execute the program PRINT (Page 33 of TOPAS Manual). This program provides the x and y coordinates in hundredths of inches for the corners of each 7 1/2', 15' and 30' quad. DO NOT use these coordinates as the x and y coordinates in the GRID preprocessor (Exhibits E3, SAMPLE PRINT OUTPUT).

DATA 1 CARD

PURPOSE: Identifies DMA Sheet information and Forest Service tape number that will be incorporated in page header.

FORMAT:

cc	use	format
1-30	Name of DMA 1:250,000 Sheet	(5A6)
31-42	DMA Sheet number	(2A6)
43-50	(Blank)	
51-62	DMA Sheet Half (East or West)	(2A6)
63-68	(Blank)	
69-80	USFS Tape number	(2A6)

ALL VALUES ARE LEFT JUSTIFIED

DATA 2 CARD

PURPOSE: This card is used to input the machine x and y limits for the DMA Sheet Half involved. The SW latitude and longitude are also put on this card to be placed in the page header with the DMA Sheet information.

FORMAT:

cc	use	format
1-5	DMA SW X	(I5)
6-10	DMA SW Y	(I5)
11-15	DMA SE X	(I5)
16-20	DMA SE Y	(I5)
21-25	DMA NW X	(I5)
26-30	DMA NW Y	(I5)
31-35	DMA NE X	(I5)
36-40	DMA NE Y	(I5)
41-45	SW Latitude of Sheet Half	(I5)
46-50	SW Longitude of Sheet Half	(I5)

ALL VALUES ARE RIGHT JUSTIFIED

```
@RUN
@ASG,A  DTIS*ABS.
@XQT  DTIS*ABS.PRINT
GLEN FALLS                        NK-18-03          EAST              FA2975
   98   18 1384  26   98 1759 1361 1778  43  73
@FIN
```

GLEN FALLS EAST

THE AMS 1/250,000 SHEET NK-18-03 IS ON TAPE F02975
THE S.W. COORDINATES FOR THIS HALF ARE LATITUDE = 43-00 AND LONGITUDE = 73-00.

IXSW = 98 IYSW = 18

+X=	0	+X=	157	+X=	315	+X=	473	+X=	631	+X=	789	+X=	947	+X=	1105	+X=	1263
Y=	1741	Y=	1742	Y=	1743	Y=	1744	Y=	1746	Y=	1749	Y=	1753	Y=	1756	Y=	1760
+X=	0	+X=	157	+X=	315	+X=	474	+X=	632	+X=	790	+X=	949	+X=	1107	+X=	1265
Y=	1523	Y=	1524	Y=	1525	Y=	1526	Y=	1528	Y=	1530	Y=	1534	Y=	1537	Y=	1541
+X=	0	+X=	157	+X=	316	+X=	475	+X=	634	+X=	792	+X=	951	+X=	1110	+X=	1268
Y=	1305	Y=	1306	Y=	1307	Y=	1308	Y=	1310	Y=	1312	Y=	1316	Y=	1318	Y=	1322
+X=	0	+X=	158	+X=	317	+X=	476	+X=	635	+X=	794	+X=	953	+X=	1112	+X=	1271
Y=	1088	Y=	1088	Y=	1089	Y=	1090	Y=	1092	Y=	1094	Y=	1097	Y=	1099	Y=	1103
+X=	0	+X=	158	+X=	318	+X=	477	+X=	637	+X=	796	+X=	955	+X=	1115	+X=	1274
Y=	870	Y=	871	Y=	872	Y=	872	Y=	874	Y=	876	Y=	879	Y=	881	Y=	884
+X=	0	+X=	158	+X=	318	+X=	478	+X=	638	+X=	797	+X=	957	+X=	1117	+X=	1277
Y=	652	Y=	653	Y=	654	Y=	654	Y=	656	Y=	657	Y=	660	Y=	662	Y=	665
+X=	0	+X=	159	+X=	319	+X=	479	+X=	640	+X=	799	+X=	959	+X=	1120	+X=	1280
Y=	435	Y=	435	Y=	436	Y=	436	Y=	438	Y=	439	Y=	442	Y=	443	Y=	446
+X=	0	+X=	159	+X=	320	+X=	480	+X=	641	+X=	801	+X=	961	+X=	1122	+X=	1283
Y=	217	Y=	217	Y=	218	Y=	218	Y=	220	Y=	221	Y=	223	Y=	224	Y=	227
+X=	0	+X=	160	+X=	321	+X=	482	+X=	643	+X=	803	+X=	964	+X=	1125	+X=	1286
Y=	0	Y=	0	Y=	1	Y=	1	Y=	2	Y=	3	Y=	5	Y=	6	Y=	8

Exhibit E3.—.PRINT output
(Part 2 of 2)

6. From data obtained from program PRINT, execute program SCANDMA (Page 38, TOPAS Manual). For 15' quad, use INC=4; for 30' quad, use INC=16' for 7 1/2' quad, INC=0. (Exhibit E4 SAMPLE INPUT SCANDMA).

FORMAT: ALL VALUES RIGHT JUSTIFIED

cc	use	format
1-5	ILEFT - The lowest x value to be scanned decreased by INC.*	(I5)
6-10	IRITE - The highest x value to be scanned increased by INC.*	(I5)
11-15	IBOT - The lowest y value to be scanned decreased by INC.*	(I5)
16-20	ITOP - The highest y value to be scanned increased by INC.*	(I5)
21-25	INC - Scan interval. For example, if INC = 3, every third elevation point will be copied from a DMA Tape.	(I5)
26-30	IXSW-X value of SW corner obtained from PRINT.	(I5)
31-35	IYSW-Y value of SW corner obtained from PRINT.	(I5)

* This value is increased and decreased to insure overlap of 7 1/2 minute quads. THIS PROCEDURE SHOULD NOT BE USED FOR AROUND THE BORDER OF THE 1/250,000 HALF. In this case, tak highest value of ILEFT or IBOT, and the lowest value of ITC IRITE that is divisible by INC.

```
@RUN,
@ASG,A  ,DTIS*ABS.
@ASG,T  GEOMHK18035,U9V,F02975
@USE    7.,GEOMHK18035
@ASG,UP 8.RYSCAN,F24  (use for input to .SLOPE)
@USE    8.,RYSCAN
@XQT    DTIS*ABS-SCANDMA
      4 160 132 664   2  98  18
@FIN
```

Exhibit E4.--Sample input for .SCANDMA
(Part 1 of 2)

```
@RUN,N W51F61,           ,ROGER,3,400

@SYM PRINT$,,

@ASG,A DTIS*ABS.
FAC WARNING       040200004000

@ASG,T G1OK*K1803E,U9V,F02975

@USE 7,, DEOK*K1803E

@ASG,UP R*SCAN,F24

@USE 8,, R*SCAN

@XQT DTIS*ABS.SCANDMA

 ITOP AND IRITE VALUES HAVE BEEN MODIFIED IF THEY WERE NOTAN EVEN MULTIPLE OF INC

 ILEFT =    4  IRITE =  160  IBOT =  432  ITOP =  654  INC =    2  NCOL =   79  NROW =  112
 YOU WILL NEED THE FOLLOWING INFORMATION IN YOUR SIZE CARD IN ORDER TO RUN COUNTOURS WITH OPCP

 XSCALE = 0.00048*MAP SCALE DENOMONITOR
 YSCALE = 0.00048*MAP SCALE DENOMINATOR
 XOO    = 1
 YOO    = 1
 XMIN   =     4
 XINC   =     2
 XMAX   =   160
 YMIN   =   432
 YINC   =     2
 YMAX   =   654

 YOU WILL NEED THE FOLLOWING INFORMATION IN YOUR SIZE CARD IN ORDER TO RUN ISOSLOPES USING FSOPCP

 XSCALE = 0.00048*MAP SCALE DENOMONITOR
 YSCALE = 0.00048*MAP SCALE DENOMINATOR
 XOO    = 1
 YOO    = 1
 XMIN   =      5.000
 XINC   =     2
 XMAX   =    159.000
 YMIN   =    433.000
 YINC   =     2
 YMAX   =    653.000

 YOU WILL NEED THE FOLLOWING INFORMATION FOR ZONEIT
 XONE =     4
 YONE =   432
 XTWO =   160
 YTWO =   432
 XTHREE =     4
 THREE =   654


 YOU WILL NEED THE FOLLOWING INFORMATION FOR THREED OR   PREP3D

 XMIN =      833.32
 YMIN =    89998.56
 XMAX =    33332.80
 YMAX =  136247.82
 M    =      79
 N    =     112

 DX =     416.67  DY =     416.67

@FIN

 RUNID: W51F61   ACCT:                 PROJECT: ROGER

      LOAD F02975 17/0 K1803E -1 W51F62

 TIME:    TOTAL: 00:00:14.823

          CAU:   00:00:05.113      I/O:  00:00:06.280

          CC/ER: 00:00:03.429      WAIT: 00:00:00.000

 IMAGES  READ:   10        PAGES:  3

 START:    05:46:55 OCT 11,1978    FIN:  05:49:48 OCT 11,1978

SIZE: 023K

EST COST:  TOTAL: 00001.42

          CPU:   00001.00 I/O: 00000.42

ESTIMATED COST IS COMPUTED AT SUBMITTED PRIORITIES.
DISCOUNTS FOR RUNS NOT PROCESSED IN SPECIFIED
TURN-AROUND TIMES ARE AUTOMATICALLY COMPUTED IN THE
MONTHLY BILLING. FIFTY CENTS MINIMUM FOR BATCH RUNS.
```

Exhibit E4.---.SCANDMA output
(Part 2 of 2)

7. Using output data from SCANDMA as input, execute program SLOPE (Page 111, TOPAS Manual). (Exhibit E5, SAMPLE RUNSTREAM.)

Data Card Formats

Only one data card is needed for input to program SLOPE. The card format is as follows:

cc	use	format
1-10	XINC Ground distance between adjacent elevation points in the X-direction.	F10.2
11-20	YINC Ground distance betwenn adjacent elevation points in the Y-direction.	F10.2

In the case of DMA tapes, the ground distance between adjacent data points in the original data tape is 208.3 feet, in both the x and y directions. If only every second point is used, then the ground distance between adjacent points becomes 416.7 feet.

8. Using output from SLOPE as input, execute program ZONEIT (Page 132, TOPAS Manual), (See Exhibit E6, SAMPLE RUNSTREAM).

Assign a temporary file, unit 7, which would ordinarily be used for a plot tape for Calcomp plotter, but will be disregarded for our purposes. Assign a file, unit 9, for the output from this program will be the input file that will be converted for use in the RID*GRID System.

Starting on Page 132 of the TOPAS MANUAL--Card 1 is blank (just place a blank card in deck). Card 2 defines the upper ranges of each slope zone. Card 3, use 100.0 for UPERIN always. Obtain ILEFT, etc., from PRINT. Card 4, obtain data needed for this

card from printfile when executing SCANDMA. Card 5, use data from PRINT. Use a separate card for each registration point. Use three registration points. (For aspect, place a -4 in columns 3 and 4 of card 2.) (See Page 139, TOPAS Manual.)

Card 1: BLANK

Card 2: (When ZONEIT is used to plot slope zones)

cc	use	format
1-4	Upper limit of zone 1 (Example: = 15 if zone 1 is to be 0-15% slope)	F4.0
5-8	Upper limit of zone 2	F4.0
9-12	Upper limit of zone 3	F4.0
o		
o		
o		
76-80	Upper limit of zone 20	F4.0

The last zone specified in this card must be either blank or the maximum possible slope in the area.

Card 3: (To Define Boundary Limits of Data Array)

cc	use	forma
1-10	ILEFT + 10 = lowest value of X in grid units	F10.0
11-20	IRIGHT + 10 = highest value of X in grid units	F10.0
21-30	IBOT + 10 = lowest value of Y in grid units	F10.0
31-40	ITOP + 10 = highest value of Y in grid units	F10.
41-50	UPERIN - 1ØØ.Ø	F10.

Card 4:

cc	use	format
1-10	XONE - X coordinate in grid units of SW corner of array	F10.0
11-20	YONE - Y coordinate in grid units of SW corner of array	
21-30	XTWO - X coordinate in grid units of SE corner of array	F10.0
31-40	YTWO - Y coordinate in grid units of SE corner of array	F10.0
41-50	XTHREE - X coordinate in grid units of NW corner of array	F10.0
51-60	YTHREE - Y coordinate in grid units of NW corner of array	F10.0

Card 5: (Coordinates of a Registration Point)

cc	use	format
1-2	Latitude in degrees	I2
3-4	Latitude in minutes	I2
5-8	Latitude in hundredths of seconds	I4
9-11	Longitude in degrees	I3
12-13	Longitude in minutes	I2
14-17	Longitude in hundredths of seconds	I4
18-20	Blank	3X
21-30	X-coordinate of registration point in grid units	F10.0
31-40	Y-coordinate of registration point in grid units	F10.0
41	=1 if this is the last registration point in the data deck =0 otherwise	I1

There should be one Card 5 for each registration point. The last registration card has a 1 in column 41. There must be at least one Card 5 (with a 1 in cc41) in each ZONEIT run.

```
@RUN,
@ASG,A   DTISXABS.
@ASG,A R*SCAN          (Output file from SCAN DATA)
@USE  7.,  R*SCAN
@ASG,UP R*SCAN-S,F24 (Slope file output)
@USE  8.,  R*SCAN-S
@ASG,UP R*SCAN-A,F24 (Aspect file output)
@USE  9.,  R*SCAN-A
@XQT  DTISXABS.SLOPE
    416.67    416.67
@FIN
```

```
@RUN,N W51F61,

@ASG,A DTIS*ABS.
FAC WARNING        040200004000

@SYM PRINT$,,I

@ASG,A R*SCAN.

@ASG,UP R*SCAN-S.

@ASG,UP R*SCAN-A.

@USE 7., R*SCAN.

@USE 8., R*SCAN-S.

@USE 9., R*SCAN-A.

@XQT DTIS*ABS.SLOPE

@FIN

  RUNID: W51F61    ACCT:                    PROJECT: ROGER

  TIME:     TOTAL: 00:00:22.657           •

            CAU:   00:00:11.813      I/O:  00:00:06.787

            CC/ER: 00:00:04.057      WAIT: 00:00:00.000

  IMAGES  READ:   .12        PAGES:  2

  START:     05:55:15 OCT 11,1978    FIN:  05:56:12 OCT 11,1978

SIZE: 044K

EST COST:  TOTAL: 00002.89

           CPU:   00002.40 I/O: 00000.49
```

Exhibit E5.---.SLOPE output
(Part 2 of 2)

```
@RUN.
@ASG,A DTISMABS.
@ASG,A R*SCAN-S. (Slope output file)
@USE  8., R*SCAN-S
@ASG,T 7.
@ASG,CP SCAN*P2OUT. (Use for input to GELCOM)
@USE 9., SCAN*P2OUT.
@XQT  DTISXABS.ZONEIT
Blank Card
  10  20  30  40  50  60  70  80  90
     -10      159      425      662      100
       4      432      160      432        4      654
43150000073000000
43153000072520050
43220056073000000
@FIN.
```

```
@RUN      [redacted]
@ASG,A DTISMABS.   aspect
@ASG,A R*SCAN-A.  (~~____~~ output file)
@USF  8.,  R*SCAN-A
@ASG,T 7.
@ASG,CP SCAN*P2OUT.  (UAL for input to GELCOM)
@USE 9.,  SCAN*P2OUT.
@XQT  DTIS*ABS.ZONEIT
Blank Card
  10  20  30  40  50  60  70  80  90
       -10        159        425        662        100
         4        432        160        432          4        654
431500000730000000
431500000725200050
432200500730000000
@FIN
```

Exhibit E6.--Sample input for .ZONEIT (aspects)
(Part 2 of 3)

```
@RUN,L W51F61,

@SYM PRINT$,,

@ASG,A DTIS*ABS.
FAC WARNING        040200004000

@ASG,A R*SCAN-S.
FAC WARNING        040000000200

@ASG,T 7.

@USE 8., R*SCAN-S

@ASG,CP SCAN*P2OUT.

@USE 9, SCAN*P2OUT

@XQT DTIS*ABS.ZONEIT
   100.00000   1.69000   2.37000

@FIN

 RUNID: W51F61   ACCT:                  PROJECT: ROGER

 TIME:     TOTAL: 00:00:25.876

           CAU:   00:00:15.237      I/O:   00:00:06.620

           CC/ER: 00:00:04.019      WAIT:  00:00:00.000

 IMAGES  READ:    17       PAGES:  2

 START:     10:33:52 OCT 11,1978    FIN:   10:36:53 OCT 11,1978

SIZE: 051K

EST COST:  TOTAL: 00006.68

           CPU:   00005.70 I/. 0000.98
```

Exhibit E6.--.ZONEIT output
(Part 3 of 3)

9. Output from ZONEIT on unit 9 is in digitized format. A program has been developed to convert this data to GRID standard format for input to the GRID system.

This file is called RID*GRID. The executable program element is GELCOM. Input is on unit 7. After the execution command, one data card is required giving a 7-digit project number and 07 in columns 8 and 9. Output file is on unit 8. See Exhibit E7 for sample runstream

On the output (See Exhibit E7) are the registration points needed to be used in the GRID preprocessor. These points are always printed following the execution command. NOTE: On the print file, longitude and latitude are given in degrees and minutes. They must be converted to hundredths of a degree for GRID. Example: 43° 15' equals 43.25° or 43° 22' 30" equals 43.375°. etc.

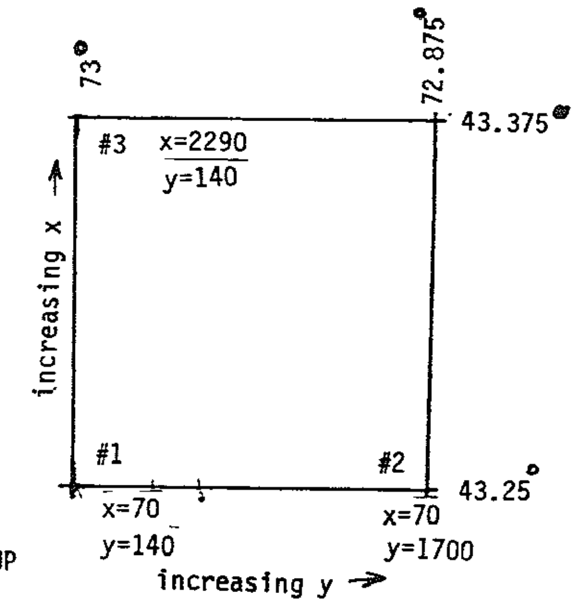
10. The output file from ZONEIT i
ready to be run through the G
Exhibit E8, shows the runstre
The window is checked to ens
covered. The preprocessed GF
independent and can be used t
the GRID procedures for COMLL
See Section C of RIDS User's

```
@RUN,
@ASG,A BIDXGRID.
@ASG,A SCAN*P2OUT.
@USE 7.,SCAN*P2OUT
@ASG,CP SCANOUT.
@USE 8.,SCANOUT (Use for input to PREPRC/COMLUP)
@XQT BIDXGRID.GELCOM
2352346.47
@FIN
```

```
@RUN W51FE1.
DATE: 101178   TIME: 111054
THE SUBJECT FILE, BROADCASTS, HAS BEEN UPDATED AS OF 10/06/78  10:59:14
@ASG,A RID*GRID.
FACILITY WARNING  000200000000
@ASG,A SCAN*P2OUT.   --> Input from ZOVEIT
READY
@USE 7., SCAN*P2OUT.
READY
@ASG,CP SCAN*OUT.   --> output file
READY
@USE 8., SCAN*OUT.
READY
@DAT RID*GRID.GELCOM
2252208007                  Y       X
431500000730000000        140      70
431500000725200050       1700      70
432200050073000000        140    2290
@FIN
```

Use these coordinates in the preprocessor .PREPRC/COMLUP

disregard these values




```
RUNID: W51FE1    ACCT:                    PROJECT: ROGER
TIME:     TOTAL: 00:00:29.982
          CAU:   00:00:20.034      I/O:   00:00:05.667
          CC/ER: 00:00:04.280      WAIT:  00:02:10.243
IMAGES  READ:    9          PAGES:  2
START:    11:10:54 OCT 11,1978      FIN:   11:16:00 OCT 11,1978

SIZE: 008K

EST COST:   TOTAL: 00013.00

            CPU:   00011.40 I/O: 00001.26  CONNECT: 0000.34
*TERMINAL INACTIVE*
```

*Exhibit E7.--RID*GRID.GELCOM output*
(Part 2 of 2)

```
@RUN,N W51FE1,              ROGER,3,400
@SYM PRINT$,,UZI988
@ASG,T A$A.,F40/200/TRK/5000
@ASG,A FID*GRID.
@ASG,A SCAN*OUT.
@ASG,CP SCAN*SLOPE. (Use for input & GRID)
@USE P., SCAN*SLOPE.
@XQT RII*FID.PREPRC/COMLUP
 $ATSLCT
 $END
 $FIDUC
  LNG1=73.00,LAT1=43.25
  LNG2=72.875,LAT2=43.25
  LNG3=73.00,LAT3=43.375
  IX1=70,IY1=140,IX2=70,IY2=1700,IX3=2290,IY3=140
  TOLER=.0016
 $END
@ADD SCAN*OUT.
@EOF
@FIN
```

```
@RUN,N W51F61,            ,ROGER,3,400

@SYM PRINT$,,UZI988

@ASG,T A$A,,F40/200/TRK/5000

@ASG,A RID*GRID.
FAC WARNING        040200000000

@ASG,A SCAN*OUT.

@ASG,CP SCANSLOPE.

@USE B., SCANSLOPE.

@XQT RID*GRID.PREPRC/COMLUP
 $FIDUC
 MINLAT  =     .43250000E+02
 MAXLAT  =     .43375000E+02
 MINLON  =     .72875000E+02
 MAXLON  =     .73000000E+02
 LNG1    =     .73000000E+02
 LAT1    =     .43250000E+02
 LNG2    =     .72875000E+02
 LAT2    =     .43250000E+02
 LNG3    =     .73000000E+02
 LAT3    =     .43375000E+02
 IX1     =              +70
 IY1     =             +140
 IX2     =              +70
 IY2     =            +1700
 IX3     =            +2290
 IY3     =             +140
 ORNTX   =               +0,            +0
 ORNTY   =               +0,            +0
 TOLER   =     .16000000E-02

  $END

  PROJECT: 2352306

    2394 RECORDS.

  MASTER-MAP SYMBOL AND POLYGON ID CORRESPONDENCE

    IDENT  SYMBOL

        1      A--
        2      B--
        3      C-
        4      D--
        5      E--
        6      F--
        7      G-
        8      H--
        9      I--
       10      J--
  $WINDOW
  OXMIN   =    .72875037E+02
  OXMAX   =    .73000143E+02
  OYMIN   =    .43250062E+02
  OYMAX   =    .43379606E+02

  $END

     546 POLYGONS WRITTEN.
       0 ARCS WRITTEN.

   RUNID: W51F61   ACCT:                   PROJECT: ROGER

   TIME:    TOTAL: 00:01:13.944

            CAU:   00:00:38.622      I/O:  00:00:26.205

            CC/ER: 00:00:09.036      WAIT: 00:00:00.000

   IMAGES  READ:   2113       PAGES:  3

   START:    20:26:15 OCT 11,1978    FIN:  20:32:42 OCT 11,1978

 SIZE: 049K

 EST COST:  TOTAL: 00009.62

            CPU:   00007.80 I/O: 00001.82

 ESTIMATED COST IS COMPUTED AT SUBMITTED PRIORITIES.
 DISCOUNTS FOR RUNS NOT PROCESSED IN SPECIFIED
 TURN-AROUND TIMES ARE AUTOMATICALLY COMPUTED IN THE
 MONTHLY BILLING. FIFTY CENTS MINIMUM FOR BATCH RUNS.
```

*Exhibit E8.--RID*GRID.PREPRC/COMLUP output (Part 2 of 2)*

11. The following runstreams are shown as examples to use the map fi that was generated from the RID*GRID.PREPRC/COMLUP preprocessor A complete description of data input and manipulation is to be found in Section A and Appendix "A" of this user's guide.

a. Exhibit E9 is used to obtain a grid output display from the PREPRC/COMLUP output file. The initial run is in a passive mode to verify the converted data then the runstream is executed in an active mode to create a master map file in t grid system. To create a map file all that is needed is tl command CREATE in the action field of "A" Card.

b. Exhibit E10 is used to obtain a single topic display of th created file. Run in a passive mode.

c. Exhibit E11 is used to convert the Master Map to alpha and change alpha characters to numeric for grey scale display. This is convenient for displaying slope data in a grey sca output rather than a single character display. These proc dures can be run either passive or active, if the user de the grey scale output, only then run it passive. If the user intends to use the slope data for manipulation in th grid system then it is advantageous to create an alpha ma file from the Master Map. This is done by executing only first "A", "G" and "R" Cards and adding the CREATE comman the action field of the "A" Card.

Exhibit E12 shows a topographic map of .GRID output.

```
@RUN
@ASG,A RID*GRID.
@ASG,A ROGER*SCANSLOPE.      (Input file from PREPRC/COMLUP)
@USE 8.,ROGER*SCANSLOPE.
@ASG,T MALL*SMN*SLOPE,U9V    (Output file)
@USE 9.,MALL*SMN*SLOPE.
@XQT,OU, RID*GRID.GRID
*                                    Omit on initial Run - Passive
A DMATAPETEST   SLOPEMAP     CREATE                         X  SLOPE
D 236236        89 8             6 43.375   43.25    73.       72.875
E SCANSLOPE
G CAB2B SLOPE            1.79441
Q               X                           6.69
T HI X                                                         )))
Z
*
@FIN
                                    Note: Execute two Runs
                                      Run #1 - Passive Mode
                                      Run #2 - Active Mode
```

Exhibit E9.--Sample input to obtain .GRID output display and create map file from .PREPRC/COMLUP output (batch mode) (Part 1 of 2)

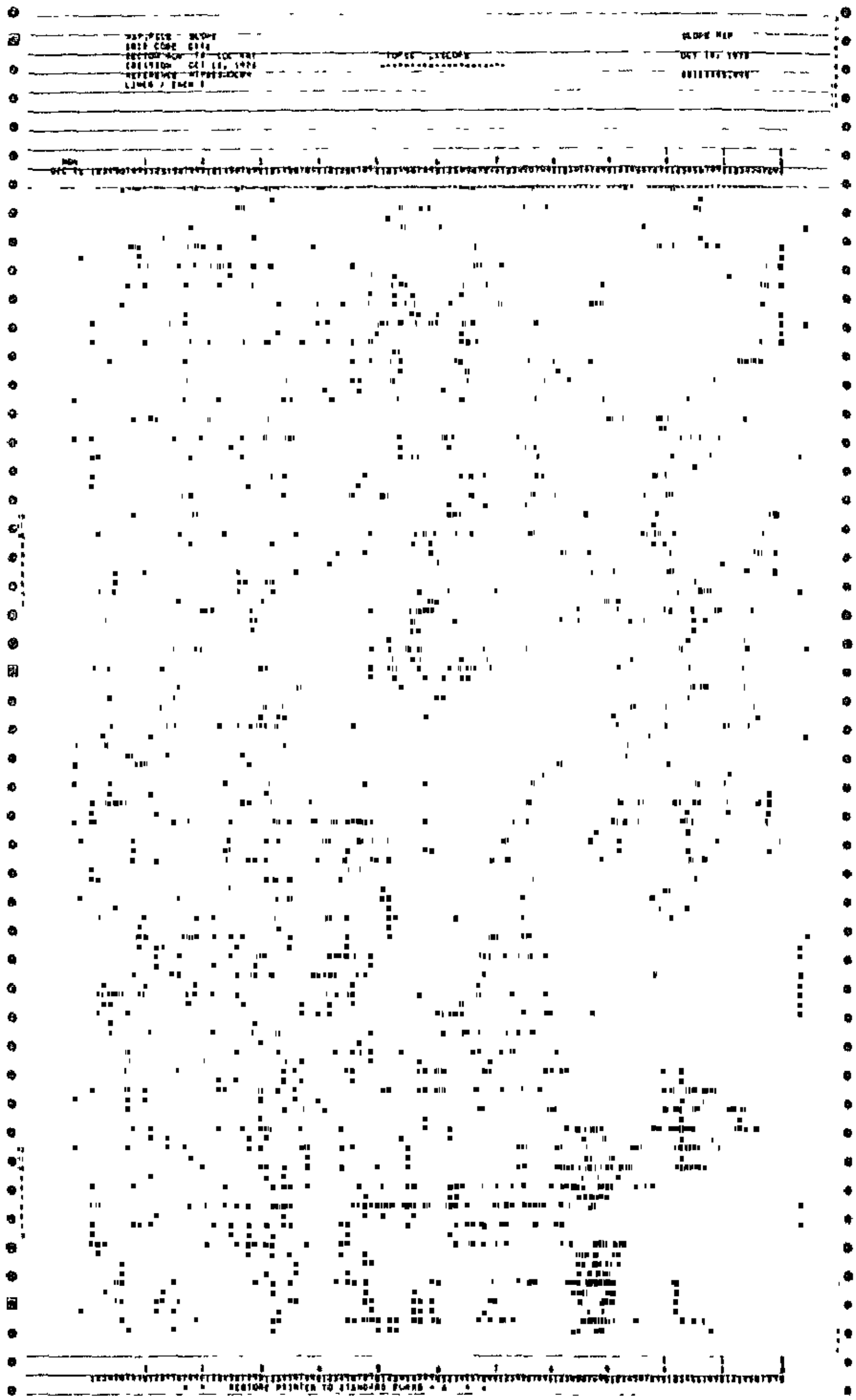


Exhibit E9.---.GRID output (slope) alpha (Part 2 of 2)

```
@RUN
@ASG,A RID*GRID.
@ASG,T WALLSANSLOPE.,U9V,F17236 (your input file)
@USE 7.,WALLSANSLOPE.
@XQT RID*GRID.DGRID (Use DGRID for demand mode operation)
*
A SLOPE MASTER                                          SLOPE
G CB02R *SLOPE          1.78441
T HI X                                                  )))
Z
*
@FIN
```

Exhibit E10.--Sample input to obtain single topic display (demand mode) - passive run

```
@RUN
@ASG,A RIDXGRID.
@ASG,T WALLSMXSLOPE.,U9V,F17236 (input file)
@USE 7.,WALLSMXSLOPE
@ASG,T WALLSMXAMSLOPE.,U9V (output file) will contain original input plus any output files created below
@USE 9.,WALLSMXAMSLOPE                    <- NOTE: SAVE THIS TAPE FILE
@ASG,T 11
@XQT RIDXGRID.DGRID
*
A SLOPE MAP                CREATE  Creates map file          SLOPE
G C0028 ASLOPE (alpha map name) 7844/
R ALPHA([XSLOPE]); (Converts Master to Alpha)

G C0028 NSLOPE             1 7844/
R IF[.ASLOPE]EQL'A'THEN'0';
R IF[.ASLOPE]EQL'B'THEN'1';
R IF[.ASLOPE]EQL'C'THEN'2';
R IF[.ASLOPE]EQL'D'THEN'3';     } Converts Alpha Characters to Numeric
R IF[.ASLOPE]EQL'E'THEN'4';       for grey scale display
R IF[.ASLOPE]EQL'F'THEN'5';
R IF[.ASLOPE]EQL'G'THEN'6';
```

```
R IF[.ASLOPE]EQL'H'THEN'7';
R IF[.ASLOPE]EQL'I'THEN'8';
R IF[.ASLOPE]EQL'J'THEN'9'ELSE'Δ';
T HI                                                )
Z                        (.) Nonzero character angle display

J SLOPE 0-10 PERCENT                      0                 1.
J SLOPE 10-20 PERCENT                     1        1.       2.
J SLOPE 20-30 PERCENT                     2        2.       3.
J SLOPE 30-40 PERCENT                     3        3.       4.
J SLOPE 40-50 PERCENT     adds title to   4        4.       5.
J SLOPE 50-60 PERCENT     grey scale output  5     5.       6.
J SLOPE 60-70 PERCENT                     6        6.       7.
J SLOPE 70-80 PERCENT                     7        7.       8.
J SLOPE 80-90 PERCENT                     8        8.       9.
J SLOPE GREATER THAN 90 PERCENT           9        9.
T HI                                               )
Z               (X) grey scale display
*
@FIN
```

Exhibit E11.--Sample input to obtain master to alpha conversion (demand mode) grey scale display (Part 1 of 3 continued)

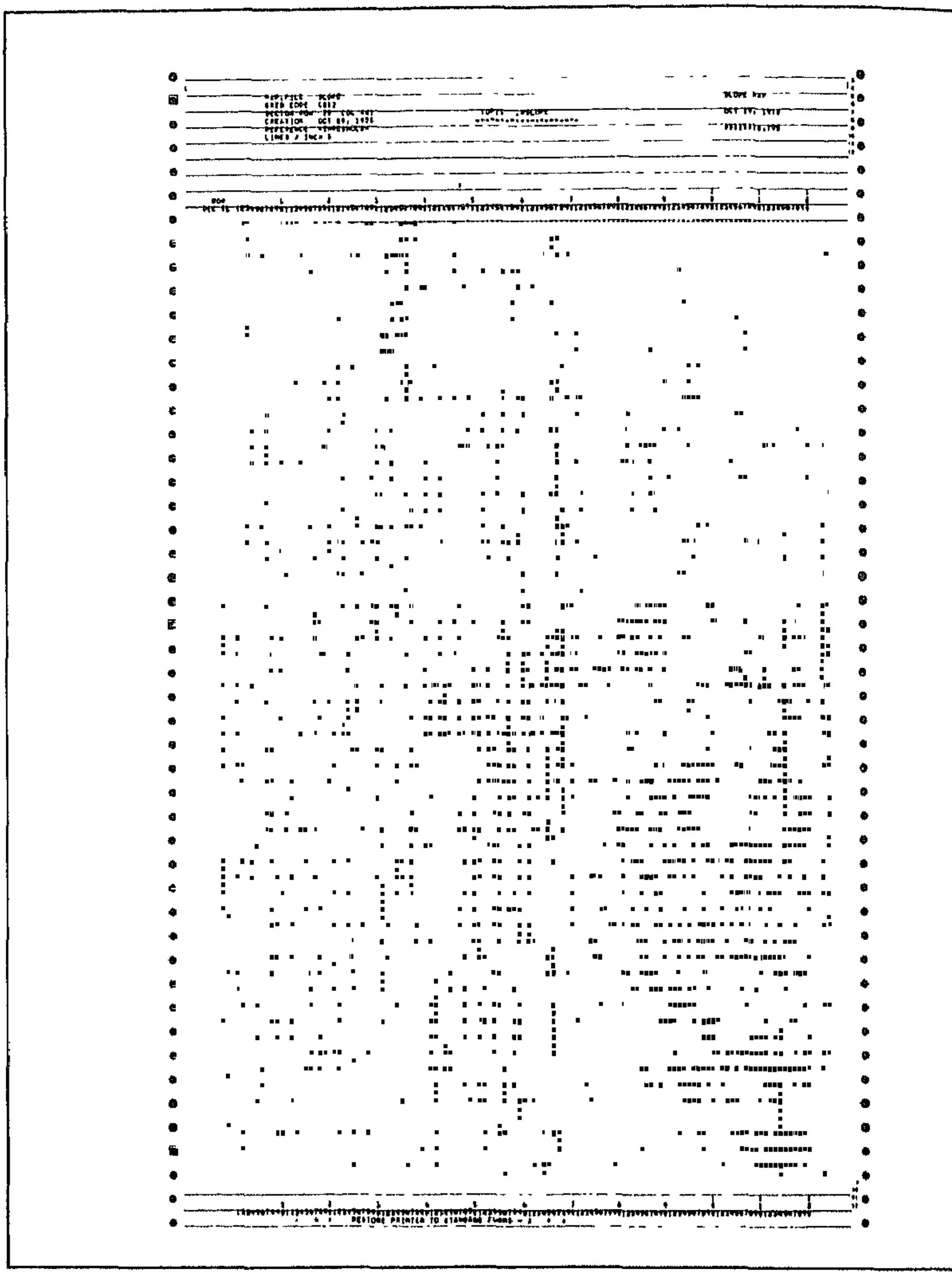


Exhibit E11.---.GRID output (slope) numeric (Part 2 of 3)

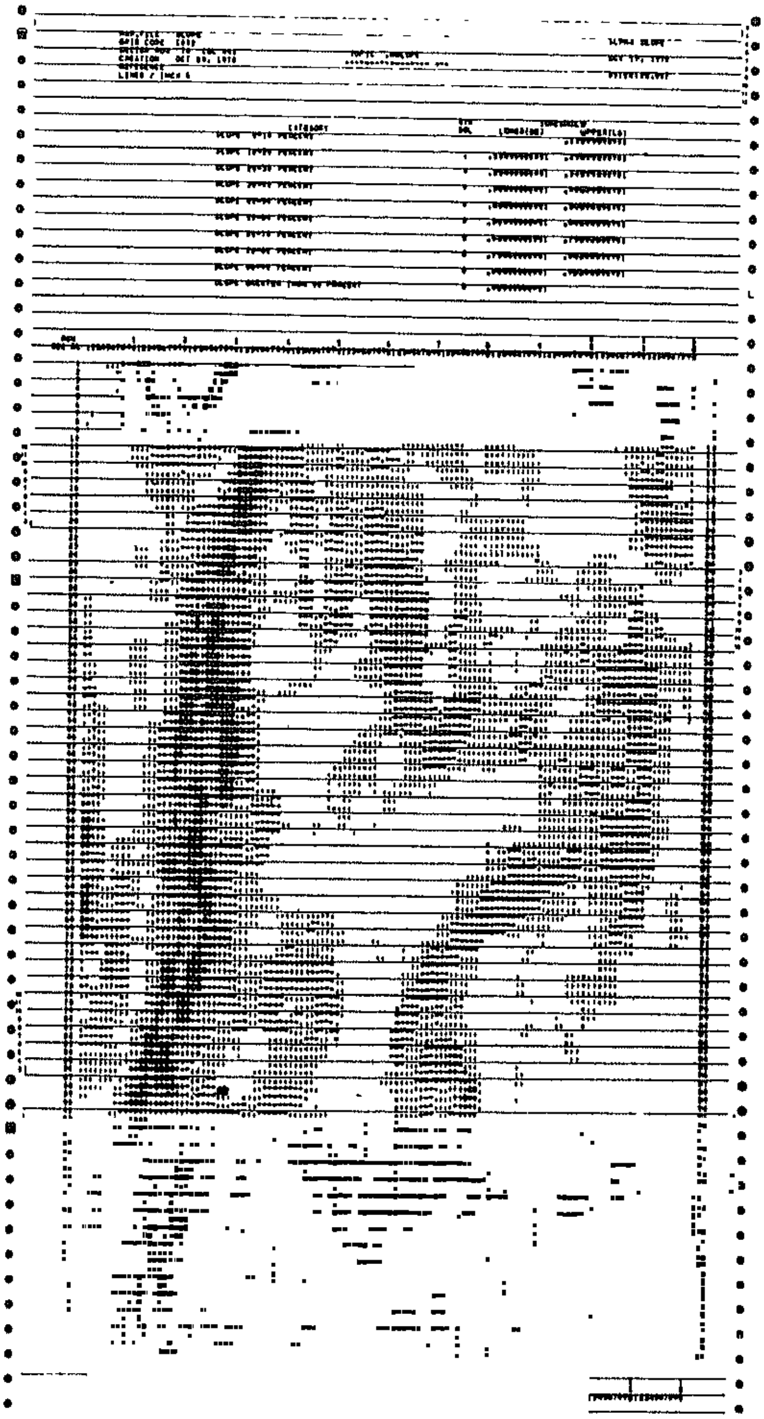


Exhibit E11.---.GRID output (slope) grey scale (Part 3 of 3)

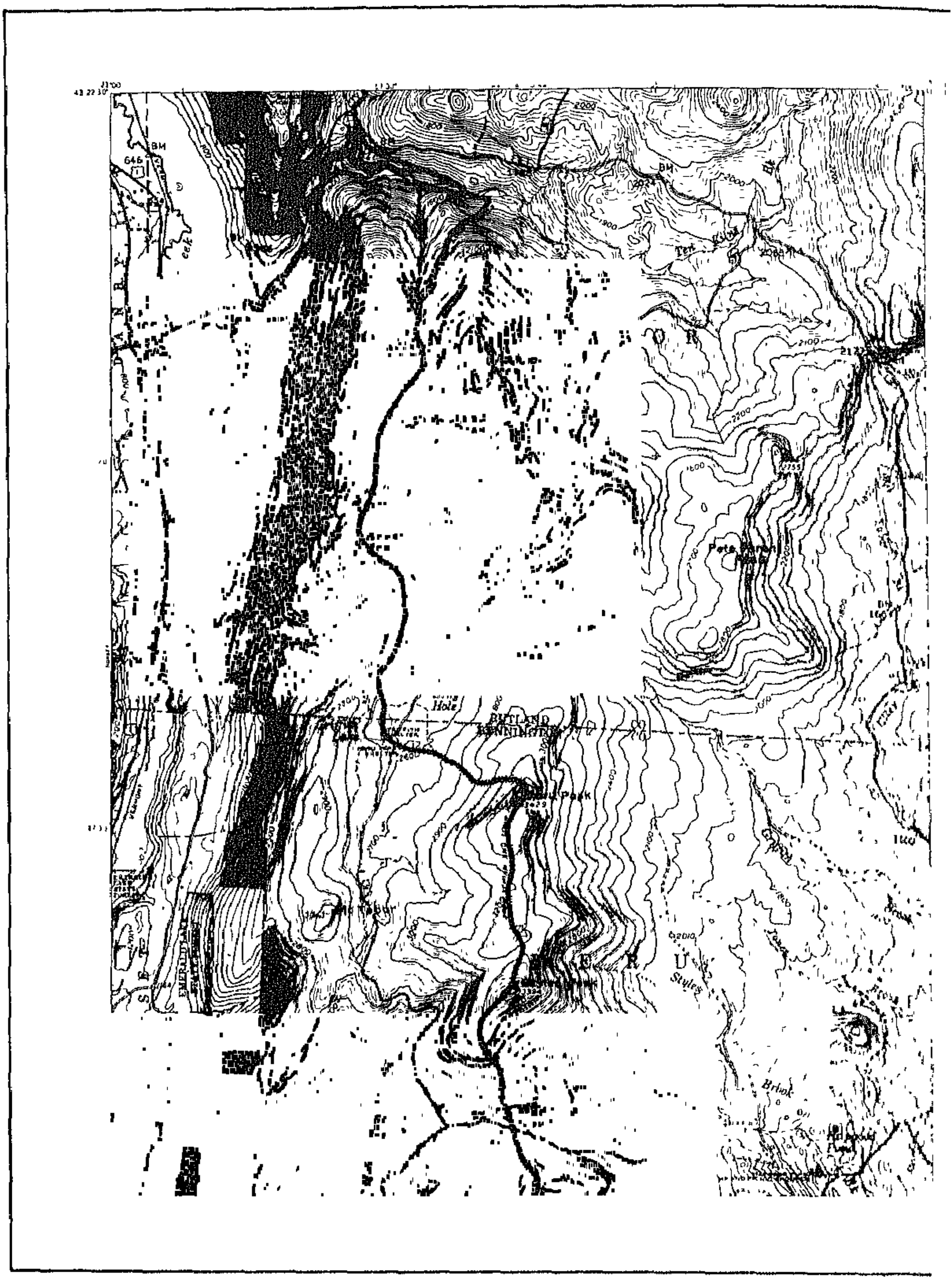


Exhibit E12.--Topographic map of .GRID output

III. COST ANALYSIS

The following are representative costs to create a slope map from DMA tapes for input to the grid system. The example used represents a 7 1/2 minute USGS quadrangle. It is assumed that the DMA tape is on file at FCCC.

PROGRAM		COST	
.PRINT		$ .79	Demand
.SCANDMA (Increment 2)		1.42	Batch Priority "N"
.SLOPE		2.89	Batch Priority "N"
.ZONEIT		6.68	Batch Priority "L"
.GELCOM		13.00	Demand
.PREPRC/COMLUP		9.62	Batch Priority "N"
.GRID	Passive	8.28	Batch Priority "N"
	Active	11.95	Batch Priority "N"
Cost to process and create map		$54.63	

The following cost is optional but should be considered for planning purposes. They are incurred on a demand terminal to convert your master map to alpha and change the alpha characters to numeric for grey scale display. The total cost for this procedure is $8.92, therefore, total cost per 7 1/2 minute quadrangle is $63.55.

APPENDIX "A" INPUT FORMS

CARD TYPE	DESCRIPTION
REFERENCE CARD	User Option to Change Base Sector Grid Code to Geographic Scale or Base Sector Origin
A	Mapping Request - Distinguishes map requests by one individual from map requests by other individuals
B	Dictionary Definition - A Table Which Relates the Geographic Shops Defined By A Master Map With A Code Representing the Area
C	Area Identification - Provides a pointer to a Specific Area Location and to Define its Unique Symbol
D	External Data File - With External Data B
E	Field Labels and For to be Assigned to Ea Fields Used with D-C

F	External Data on Card-Input File - User Describes Format and Order of Appearance of the Data Described on E-Card
G	Map Definition - Provides a Unique Identification for the Map Being Prepared
H	Text Overlay - Overlays short text statements within the Body of a Map to Assist in Interpretation of the Display
I	Title - User Supplies Title or Legend When Generating New Maps
J	Scale - Used for Re-coding and Weighting Values for Manipulation and Display
K	Map Generation by Symbol Conversion - Allows for the Generation of New Maps which may be Created from Existing Maps
N	Map Generation by Dictionary Symbol Conversion - If Desired Map to be Generated is Based Upon Areas Defin in a Dictionary, Use of the N-Card is Required
O	Map Generation by Points or Lines - Provides the Faci of Generating Maps by Defining Data Points or Data Li Within the Study Area with Associated Value
P	Generation by Element Matrix - Provides for Initial of Cell Coded Data in Matrix Form Acceptable to GRID

Q Topic Generation by External Data - Used in Conjunction with an External Data File Defined on D and E-Cards

R Map Composition - Used for Defining the Combination of Overlays to Obtain Desired Output

S Report Title - User Inputs Alphanumeric Statistics Reports Title

T Statistic Parameters - User Selects Type of Statistical Report Available From System

U Independent Maps - Used Only When a Multiple or Stepwise Regression has been Requested on T-Card

V Study Area Legend - Supplies Notes to the Generated Map which are Pertinent to all Maps in Study Area

W Window Display - Selectively Displays a Portion of the Area Defined in the G-Card

X Precedence Table Change - Used to Change Values of Default Settings

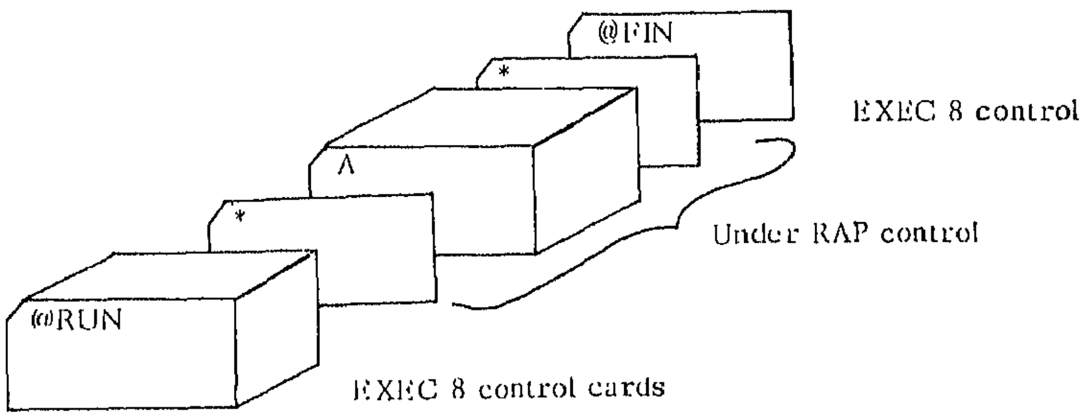
Y Change Overprint Combinations - Varies Gray Tone Output for Numeric Maps

Z Map Display - User Options to Modify Output for Display Purposes

APPENDIX "A" INPUT FORMS

INPUT FORMS

This Appendix deals with the card input definitions and allowable codes. All input cards must have the card type indicated in column 1. This applies to Batch Processing and to Demand Mode* of operation. In Batch Processing the input deck must be preceded by an asterisk card and must be followed by an asterisk card. The input deck should look as follows:



*NOTE: Only the following input card options are available in Demand Mode operations.

Reference Card A, G, H, I, J, K, P, R, S, T, V, W, Y, Z.

REFERENCE CARD

The base sector grid-code-to-geographic scale may also be changed by the GRID user. As indicated in Table 2, the default value of the base sector (grid code = 1) is 3.75 minutes in both latitude and longitude at 8 or 6 lines per inch; 3.00 minutes at 10 lines-per-inch. Both latitude and longitude scales may be changed independently of each other.

To change these entries, input a card with the following informatio at the beginning of the runstream, perferably before the first A-Car See Section A; II A3c for additional information.

Columns 1 through 9	REFERENCE
Columns 11 through 20 (i.e., 7.233)	Extent in the X-direction (longitude), expressed in minutes-per-sector of the base sector. (Grid Code 1.) Decimal point must be entered.
Columns 21 through 30 (i.e., 6.533)	Extent in the Y-direction (latitude), expressed in minutes-per-sector of the base sector. Decimal point must be entered.
Columns 31 through 40 (44°05'00" = 44.0833)	The reference latitude in decimal degr Decimal point must be entered.
Columns 41 through 50 (71°25'00" = 71.4166)	The reference longitude decimal degre Decimal point must be entered.

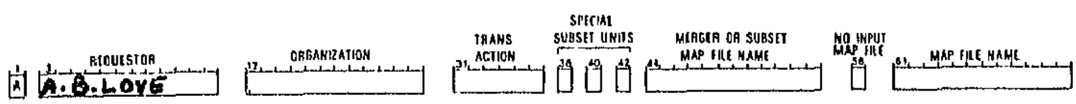
1 9	11 20	21 30	31 40	41
REFERENCE	7.223	6.533	44.0833	71.4166

A-CARD MAPPING REQUEST

The A-Card distinguishes map requests made by one individual from map requests made by other individuals. It is a personal identification card which is listed on the output transaction register and on the top of each output map. This includes the name of person making a map request, his organization, the type of transaction, and the map file to be used.

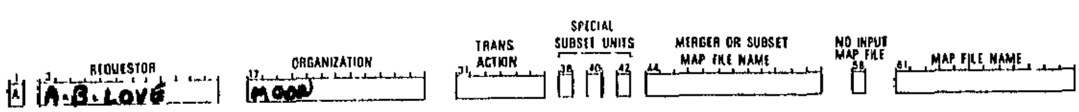
Requester

The requester field will contain the name of the user, and is optional. This field should be left adjusted and may contain a maximum of 12 characters. The program will accept any combination of numbers and characters.



Organization

The organization field will contain the name and/or the number of the requester's department. Its main purpose is to provide an identification for returning the system <u>output</u> to the requester. This field should be left-justified and may contain a maximum of 12 characters. The program will accept any combination of numbers and characters.



Transaction

Passive

The transaction field of the A-Card is normally left blank indicating passive participation with the Map File. Passive participation merely indicates that the Map File is not physically affected, only monitored. This passive transaction may be used for editing input card formats and producing verification line printer plots. These plots may be used in conjunction with the source maps in editing the input data. The passive transaction is very cost effective and should be used whenever feasible.

Active

There are six possible entries to the transaction field which will implement a change to the Map File. This is defined as having active participation with the Map File. These transactions are:

"CREATE" would be used in adding new maps titles or dictionaries to the Map File.

"MODIFY" would be used to add new entries to a dictionary or to change current entries in an existing map, title or dictionary on the Map File.

"REMOVE" would be used to erase entries in an existing dictionary the Map File. Parts of dictionary entries may be deleted by specifying appropriate C-Cards.

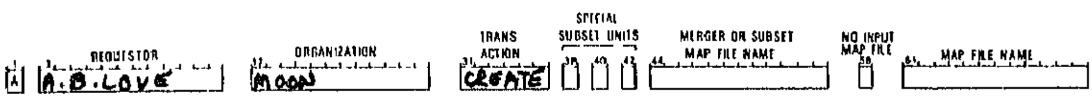
"DELETE" would be used to destroy an entire map, title, or dictionary on the Map File. Further references to this map, title, or dictionary after a "DELETE" transaction would be flagged as an error by the system since it would no longer exist.

"MERGER" would be used to combine existing maps, titles or dictionaries from one Map File onto another. The merger file name placed in columns 44 through 55 and the file name to which the

elements are to be merged is placed in columns 61 through 72. Only 'B' cards and 'G' cards are permitted to follow a merger operation. These cards will indicate which maps from the merger file are to be kept, and the other data will not be merged onto the new map file. A new 'A' card with another transaction or an '*' card will get the user out of merger mode.

"<u>SUBSET</u>" transaction will produce a spin-off file in this system format containing only the elements referenced on subsequent 'B' or "G" cards. The new subset map file name is entered in columns 44 through 55.

Transaction errors could jeopardize the Map File and for this reason these six transactions must be used by individuals with complete understanding of this system.



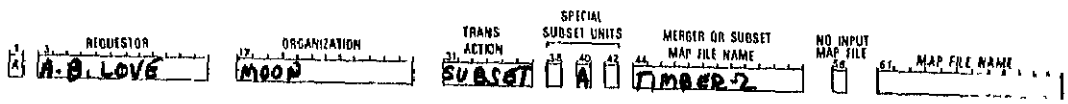
<u>Special Subset Units</u>

These columns are usually left blank, but when the transaction of "SUBSET" or "MERGER" are used, the number of the external unit being used must be placed in these columns. If the transaction "MERGER" is placed in columns 31 through 36, then column 38 must contain the unit on which the merger file resides. This unit can be established with an EXEC 8 assign card (@ASG) or with a use card (@USE). Example, if an 'A' was entered in column 38, an assign card could appear as @ASG,T A, U9V, F04977, this would have the tape F04977 mounted on the tape drive and call the tape drive unit "A". Column 40 follows the same rules as column 38 but this applies when "SUBSET" is the transaction.

Column 42 is marked when the "SUBSET" transaction is used and it is desired to have an output tape generated which is suitable for external statistical analysis. The resulting tape file will be void of all legends, titles, etc., and will only represent the actual map values. A form will be printed by the system depicting the output tape format.

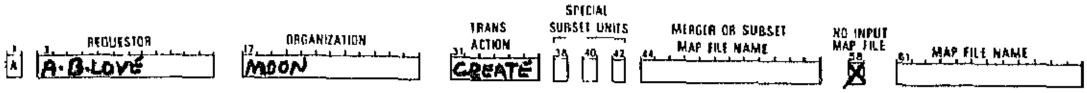
Merger or Subset Map File Name

This field is normally left blank. A "MERGER" transaction uses this field to indicate the external map file name which is to be merged onto the file indicated in "map-file-name" field. It it is desirable to have a subset, of the maps stored on the master map file, written on a separate magnetic tape, a subset file name must be entered in this field. The new subset map file created can be considered a master map file in its own right, and in subsequent runs the new name could be referenced in the Map File Name field (columns 61 through 72).



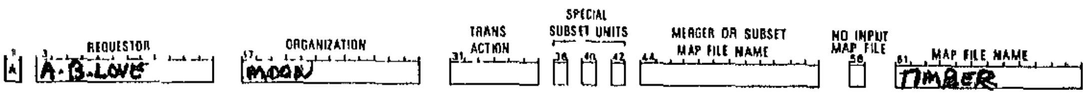
No Input Map File

This field is normally left blank. It is used only for the special case of beginning a new map file. If a map file has not been previously established, an X in this field will denote that a file o the name entered in the Map File Name field (columns 61 through 72) does not currently exist. Therefore, in your runstream no tape is assigned to the input unit 7. If this field is used then the Map Fi Name must be entered.



Map File Name

The Map File Name is a reference to a specific magnetic tape. It may be thought of as a tape label. The name of the map file must appear exactly as previously defined, since it is used to locate the proper map file. Entries must, therefore, reference a valid file name, be left-adjusted, and may contain a maximum of 12 characters.



B-CARD DICTIONARY DEFINITION

The dictionary definition card provides a unique identification to the map dictionary being prepared. The map dictionary is a table which relates the geographic shapes defined by a master map with a code representing the area.

Grid Code

This field provides a means of separating dictionaries with identical names but having different element sizes. The grid code is divided into two parts: level and lines-per-inch. The level refers to the relative area covered by the elements within the map. See Table 2 Section A for correspondence between level designation and map scale.

The second part, lines/inch, must be either 6 or 8 depending on the configuration of the available equipment. Further, since master maps and dictionaries operate in conjunction with one another, the grid code of the dictionary must match the grid code of the associated master map. If the use of dictionaries and master maps of different grid codes is attempted, an error message will result.

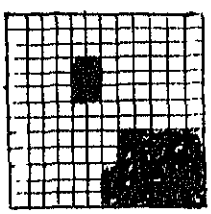
Dictionary Name

This field is used to designate the dictionary name. Dictionary name chosen must relate to the master map of the same name except for the first character, i.e., $COUNTY would be the dictionary of the master map designated *COUNTY. Note that the Dictionary field is only 9 characters in length instead of the normal 12-character name. This

to facilitate the use of aggregate area definitions. A dictionary name is a combination of the 9 characters in the Dictionary Name Field in addition to the 3 characters of the Aggregate Area Dictionary Suffixes. The combination comprises the normal 12-character name. If in referencing a dictionary, the last 3 characters are blank, the program assumes that the basic area definitions are being referenced and not the aggregate areas. Dictionary should be defined at the smallest workable area size that is consistent with the study to be performed.

Noncontiguous Search Factor

Whenever two or more areas with the same polygon codes do not share the same boundary, then the system must be called upon to perform a search to locate these noncontiguous (not sharing the same boundary) areas. This occurs for example where an island is part of a shoreline county.



NON-CONTIGUOUS SEARCH FACTOR
FOR THIS EXA

The number of factors assigned depe
(cells) between the areas within th
if the island was the only noncont
was two elements away from the shor
would be placed in the noncontiguou
finding the island.

The value or factor may range from 0 through 9. Blank is considered as zero. Since the search will be conducted from the border points o each area, care must be taken that this factor is not made so large that unique areas are also thought to be contiguous. This field save the use of an area pointer on the C-Card. The area pointer is used t indicate which area within the master map belongs to specific area code and area symbol being defined.

Area Pointer Representation

This field informs the system of the form in which the area pointer i to appear on the following 'C' Cards and the position is to be marke with an X. One and only one pointer type must be marked. The three choices are:

- Grid Code - Pointer by sector row-column and element row column
- UTM - Pointer with UTM easting, UTM northing and the UTM zone.
- Geographic Coordinates - Latitude and Longitude

When 'C' Card processing takes place, the system will convert all pointers internally to grid code form.

Aggregate Area Dictionary Suffixes

Up to six aggregate areas to the basic area definition may be define This option is used whenever the basic areas may be aggregated to fo a new geographic area of meaning. It is, therefore, possible to define up to seven dictionaries on one set of 'B' and 'C' Cards. Th entries on the B-Card are the last three characters of a 12-characte name. This name consists of nine characters from columns 9 through

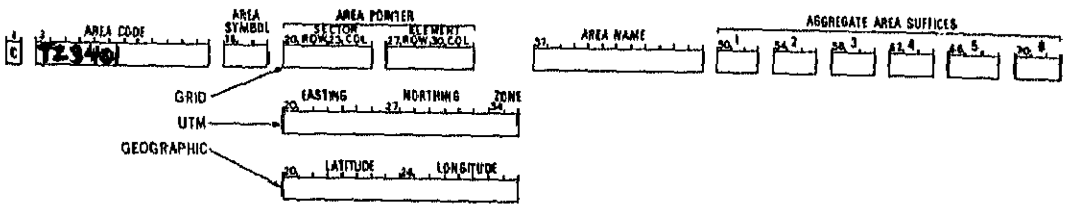
of the B-card followed by the 3-character aggregate area dictionary suffix.

C-CARD AREA IDENTIFICATION

The purpose of these cards is to provide a pointer to a specific area location and to define its unique symbol. One or more C-Cards must be provided for each area within the study area. A secondary purpose of the C-Card is to provide the aggregate area symbol coding. This is used whenever a group of areas can be summarized to a higher level. For example, if counties were the areas being defined, new areas can be defined as aggregates of counties such as regions, States, districts, etc. For this reason, dictionaries should be defined at the smallest workable area size that is consistent with the study to be performed.

Area Code

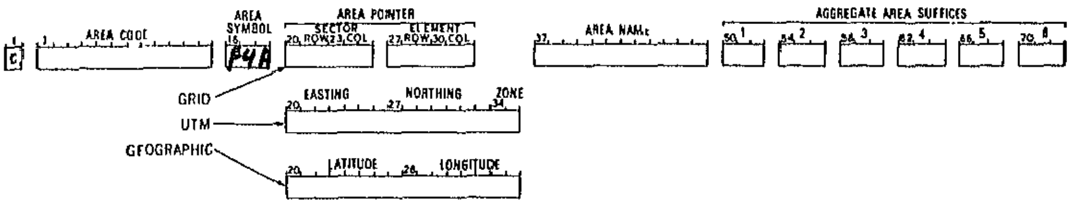
Each unique area must have assigned to it a numeric code to allow the system to interface with data files. This code is at the discretion of the technician. It must, however, match the coding structure of the data files to be used. If, for example, it is desired that 1970 census data are to be mapped, the 1970 census codes must be used as the area codes. Area codes are treated as alphanumeric fields and, therefore, must be left-justified. If more than one C-Card is used the area codes must be in an alphanumeric sequence, with the alpha character taking precedence.



Area Symbol

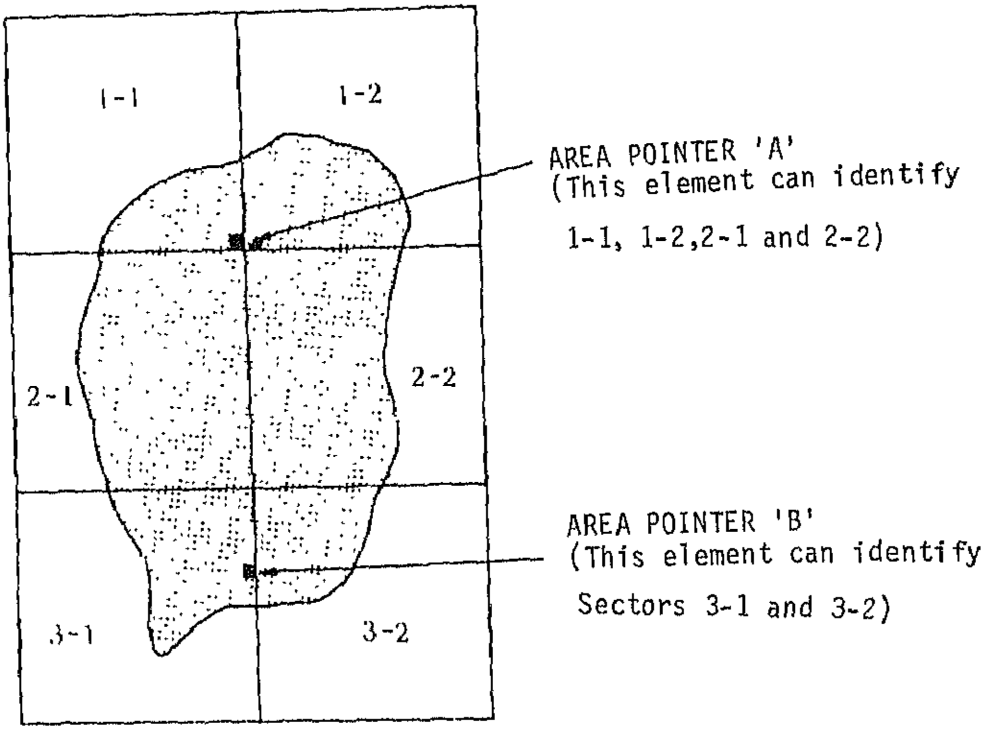
Area symbols are comprised of three characters: a 1-character alphanumeric prefix, and a 2-character alphanumeric suffix. There are 44 valid symbols which are listed on the K-Card form. Each area must

have a 3-character symbol assigned to it. Within a study area, two areas must never have the same symbol. The prefix symbol character assigned must match the character assigned to the area on the master map element matrix; i.e., if the area has been designated as F on the master map, the symbol assigned on the dictionary must begin with F, such as FØ2 or F4A, etc.



Area Pointer

The Area pointer field indicates which geographic shape within the master maps belongs to specific area code and area symbol being defined. Since the master maps may have several areas defined as symbol "F" for example, it is necessary to distinguish between FØ2 and FØ3. <u>Grid code area pointer</u>: Since each of the sectors has a unique row of column combination, an area on a master map can be easily identified referencing an element within the area by specifying a sector row and column and an element row and column. The entries to be made are numeric in all cases and, therefore, must be right-justified. If the area being defined is totally contained within a single map sector, any element row and column combination falling within the area is valid. If, however, the area extends into other sectors, the element row and column combination must be one of the sector border elements which share the same boundary to the other sectors involved.



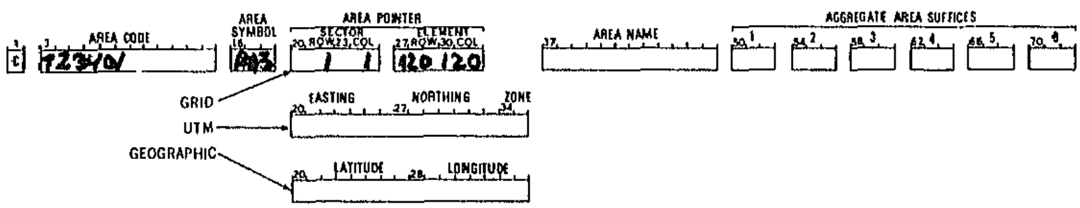
Contiguous Area Pointers

Figure C-1

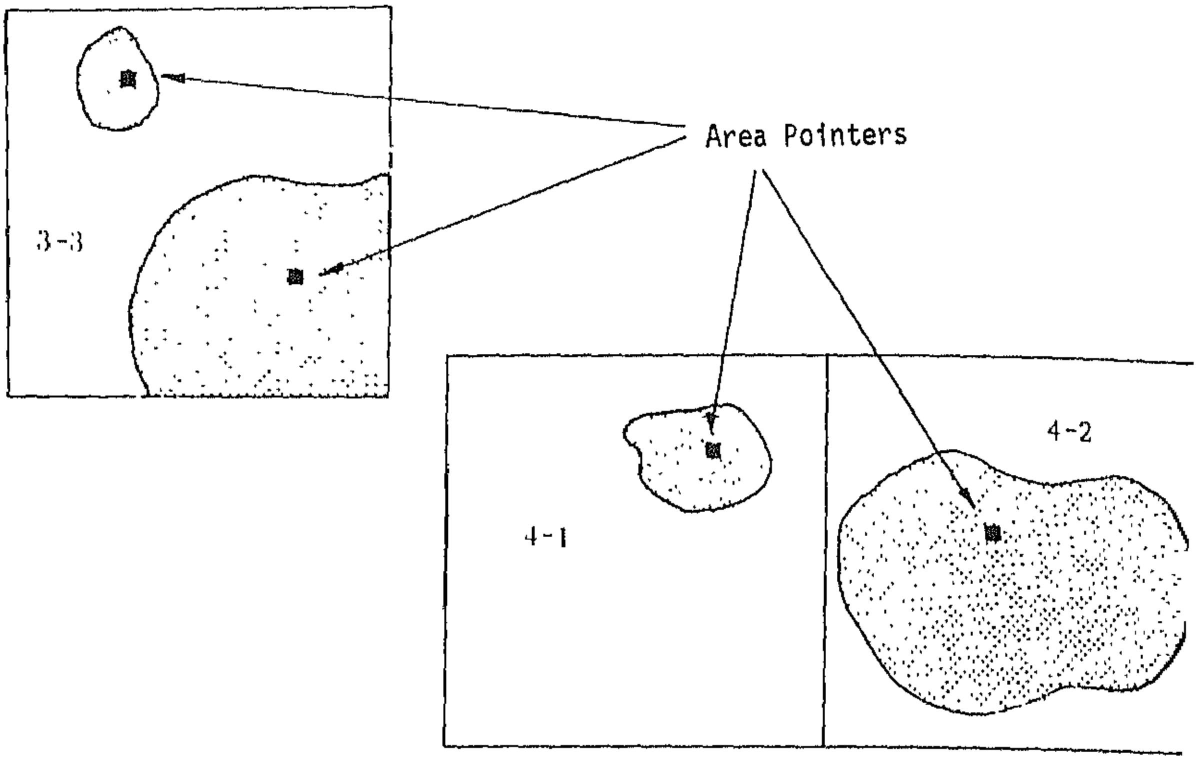
The example above can be used to describe three cases of areas extending into more than one sector.

1. If the area in question were contained <u>entirely</u> within sectors 3-1 and 3-2, the element row and column designat would be valid at any point along the border between 3-1 3-2 and could be on either side of this border. Area Pc indicates one such point.
2. If the area were contained entirely in sectors 1-1, 1-2, and 2-2, then the element indicated by the row and colur lie at one of the intersecting corners of the four sect involved (Area Pointer A).
3. If the area extended into more than four sectors, then single entry point would not suffice to link the areas.

together. When considering the entire shaded area above, additional area pointers are required. This requires an additional C-Card for each additional pointer to be indicated. The additional C-Cards are identical to the data on the first C-Card except for the sector and element fields. These fields indicate the change of the area pointers by chaning the row-column information. In the above example sectors 1-1, 1-2, 2-1, and 2-2 are linked by one area pointer and 3-1 and 3-2 by the second. Care should be taken to use as few area pointers as possible, since additional area pointers cause additional processing.



The need to provide more than one area pointer as described in case 3 above, can occur in other cases as well. The two examples below show the same geographical entity in noncontiguous situations (areas to not share the same boundary). Sector 3-3 has two area pointers despite the fact that the island is within the same sector. The two entries are necessary when the noncontiguous search factor which indicates number of elements or search factor size, is too small to span the distance between the island and the mainland.



Noncontiguous Area Pointers

Figure C-2

When the island appears in a different sector than the mainland, as is the case in Sectors 4-1 and 4-2, there is no place along the common border of sectors 4-1 and 4-2 where the related areas touch, therefore, two area pointers are also required in this case. This is necessary regardless of the search factor size since searching does not continue across sector boundaries.

Pointer Representations

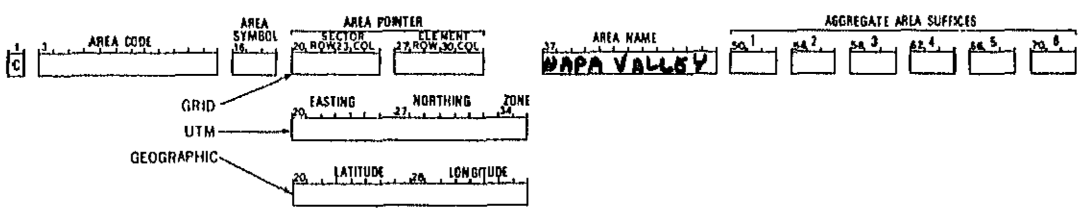
UTM Area Pointer: If the area is entered with the UTM coordinate system then a UTM easting, northing and zone are necessary. The point is immediately converted by the system into the grid code coordinate system and then handled as grid code pointer as previously

defined. Caution must be exercised when attempting to place an area pointer on a sector boundary for use with multi-sector areas. In using UTM area pointers, it is safer to enter a pointer to the same area twice than trying to hit one of the sector edge rows or columns. Multiple area pointers to the same geographic area will not confuse the system.

Geographic Area Pointer: The area pointer is given with a latitude-longitude combination and immediately converted to grid code coordinate system. The same rules and cautions apply to geographic pointer as with UTM area pointer.

Area Name

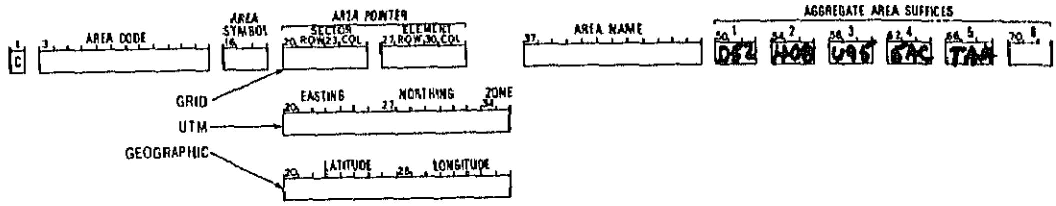
The area name is assigned to assist the user in retaining the identity of the area. It generally refers to the basic area and not the aggregate areas. If counties are the areas being coded, the names of the counties would be included in this field. The area name is not used by the program; however, it is listed on the transaction register output. The program will accept any combination of numbers and characters.



Aggregate Area Symbols

Frequently areas are aggregations of the ones being coded, such as States, districts, regions, watersheds, etc. If this occurs in the process of coding various areas into a dictionary, the aggregate areas may also be coded with their own unique 3-character symbols. An aggregate map could then be created using these symbols by referencing the appropriate 9-character master map name and the 3-character

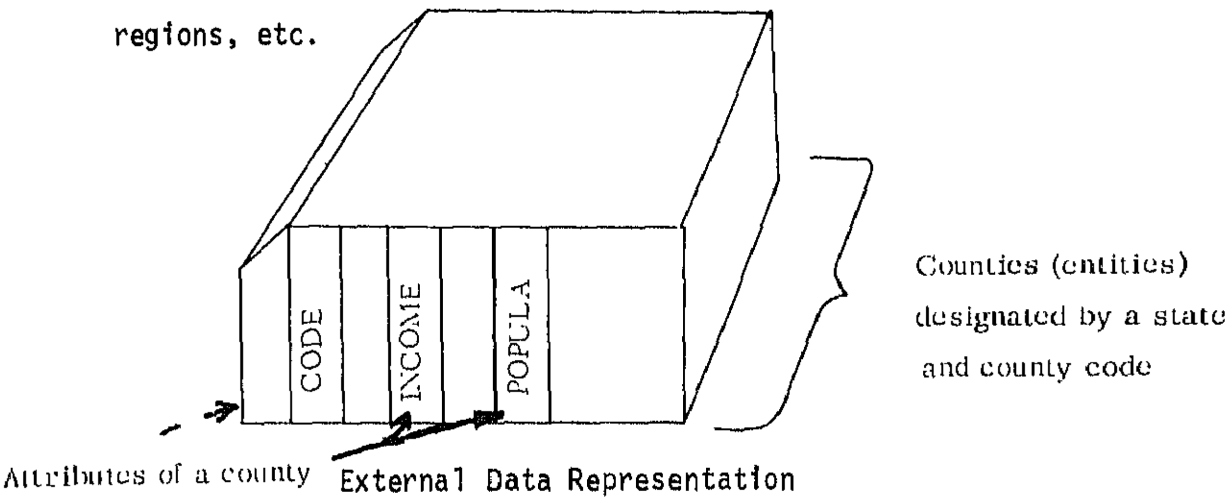
aggregate area suffix defined on the B-Card all combined into one 12-character master map name. Each aggregate area can be considered a dictionary in its own right and is independent of any other aggregate area. Each, however, is dependent upon the basic area defined in columns 16 through 18.



D AND E CARDS STUDY AREA EXTERNAL DATA FILE

Introduction

D and E Cards are used to interface the system with external data bases. Before discussing the D and E Cards individually, a brief discussion of the interface needed for external files is in order to provide a basis for understanding the required entries. If we view the data tape as a coded card deck, it would appear as shown below. The deck would contain coded information on various attributes such as median income, population, etc., for various entities such as counties, regions, etc.



External Data Representation

Figure D-1

The *first* interface requirement then would be to describe the data to the program. It is necessary that the program knows where on the card the information resides, and which attributes the data represent. This is accomplished by a data format which indicates the fields of the cards and what information they contain. Within GRID this requirement is met by naming and describing each field on the E-Card in combination with the D-Card.

The second interface requirement is to provide a means of linking the code such as State 5, and County 11 (combined to a common field such

as 5Ø11) with the master map area. The master maps stored correspond to geographic areas and are designated by alpha and numeric symbols within a sector. These symbols do not correspond to the codes of the data deck. To further complicate the problem, a given code on the card deck may provide data for several sectors since, for example, a county could lie in four sectors. This requirement is met by referencing the suitable cross-reference dictionary or master map on the D-card.

Digitized data provides an immediate form of cross-referencing, since the coordinates describe the geographical area with which the attribute values are linked. No other cross-referencing mechanism (master map, dictionary) is necessary in this case.

D-CARD EXTERNAL DATA FILE

<u>External File Name</u>

Columns 3 through 14 should contain the name of the external data file. This file name, is some instances, is checked against the actual data file to verify that the correct file is mounted. This field must be left adjusted and may contain a maximum of 12 characters.

<u>File Type Selection</u>

The system accepts nine categories of external file inputs. A file in any one of these categories is selected by coding its index number in the file type selection field of the D-card. The categories and their index numbers are:

<u>01 FORTRAN I/O FORMATTED</u>

FORTRAN format is defined to be any external file which meets the following requirements:

- Data records must be in either IBM-BCD or UNIVAC-Fieldata format.
- Each record must not be greater than 132 characters long and must be fixed length.
- One field in each record must be the identifying code, symbol or area pointer supplied in a field whose maximum size is 12 characters.
- The tape may be in any sequence.
- The tape must be readable without software translation, unblocked, without header or trailer records and closed with an EOF mark.
- Internal unit must be numeric.

02 FMPS FILES (FUNCTIONAL MATHEMATICAL PROGRAMING SYSTEM)

- Variable names used in an FMPS model become part of the records output by FMPS and serve as a reference link to their data.
- GRID users intending to map FMPS data must observe some restrictions in variable naming within FMPS. Any FMPS variable which is to be mapped must have some spatial aspect; and this aspect is represented within its name. These variable names have two parts:

  1. A 5-character descriptive part.
  2. A 3-character area symbol (dictionary cross-reference).

An example is TIMBRA3U where "TIMBR" is the descriptive part, and "A3U" is the symbol for some area (this symbol must be blank if the variable has no spatial meaning). The procedure for defining FMPS records (E-cards) is different from those for other files. For a given variable, not only its solution value, but other derivative values are stored. The system uses certain key-words as qualifiers to variable names to indicate which derivative item is to be mapped. The naming syntax in GRID is (variable . qualifier). The qualifiers and

and their meanings are:

1. ACTIV Activity
2. SLACT Slack Activity
3. DUACT Dual Activity
4. INCST Input Cost
5. MRACT Marginal Activity

Coding TIMBR.ACTIV (on an E-Card) would direct the system to collect, for possible mapping, the primal activity value for the variable, TIMBR, for all geographical areas in the file. Internal unit must be numeric.

03 GIM DATA BASE

° Unimplemented

04 ERTS IMAGERY

° Unimplemented

05 F-CARDS DATA ONLY

° Data appears immediately in GRID runstream (See F-Cards).

06 "USER" DATA

° This is defined as any foreign data base for which additional programing is necessary for processing, either prior to or during system execution. A file type of Ø6 as indicated on this card, means that data is to come from a user defined source. Too many varieties of input tapes exist to enable an easy input request to be constructed specifying all the required parameters.

  In all cases involving user defined external data, a read routine has to be supplied. This routine has to be written in FORTRAN IV or V and must be a subroutine called USERRD.

  The parameters for this subroutine are shown in the following GRID call statement: CALL USERRD (NCOND, NSTAT, BUFFER, LENGTH, unit)

NCOND is a one word variable, used by the system to tell the read routine what is to be done:

NCOND = 1 Open the file, perform all functions necessary to start reading records, such as reading header records, reading format data cards from the cardstream, etc.

NCOND = 2 Return the data for one area to be mapped in the array BUFFER.

NCOND = 3 Close the file, if necessary print out record counters, etc.

NSTAT is a one word variable used by the read routine to tell the system the outcome of the requested action.

NSTAT = negative An error of some kind occurred, the read routine is not able to recover.

NSTAT = 0 Requested actions completed, essentially the data for the next area have been transferred to the array BUFFER.

NSTAT = positive The end of the external data has been reached, or the end of the file has been encountered, etc. The array BUFFER does not contain any more data.

BUFFER is a 2,000 word work array for the routine USERRD, which will transfer the data for each area into the first words of BUFF

LENGTH is a one word variable defining the number of words of data expected by the system in BUFFER and computed according to the specifications of the E-cards.

UNIT is the indicated unit from column 19 of D-card.

All data to be transferred to the system have to be numeric decimal numbers except the cross-reference field. The sequence of the data fields is expected to be the same as that of the names given on the E-cards which represent one word each, again except for the

cross-reference field.

The cross-reference field, found on the E-cards and in the proper sequence on the E-card, stands for a one, two or three word field depending on the type of cross-reference being used. If the data read in by USERRD contain the code structure used in a dictionary, this field must be two alpha words equal to the 12-character code in the dictionary. If the cross-reference is by symbol, (basic areas or aggregate areas), then this field is one alpha word long, 3 characters left-adjusted. For a cross-reference by area pointer (geographic or UTM) this field is two or three words long respectively.

Figure D-2 shows a flowchart of a read routine. Figure D-3 is a sample read routine used to read a binary tape.

07 GIRAS FILES

GRID is capable of processing any of the USGS "GIRAS" data files. The map-based data contained in these files are represented as a set of polygons, arc segments and coordinates in digital form. Associated with each polygon is an "attribute," which is a coded representation of the feature which polygon boundary describes. Up to six data sets (map-layers) may exist in a GIRAS file. These are:

1. Land Use and Land Cover
2. Political Unit: (places, counties, States)
3. Hydrologic Units
4. Census County Subdivisions
5. Federal Land Ownership
6. State Land Ownership (optional)

In GRID, a given data set is handled by separately preprocessing it into GRID-standard form. The program, PREPRC/GIRAS, performs this operation on the GIRAS data files. Preprocessing consists of chaining all the arc segments which make up each polygon and applying a digital

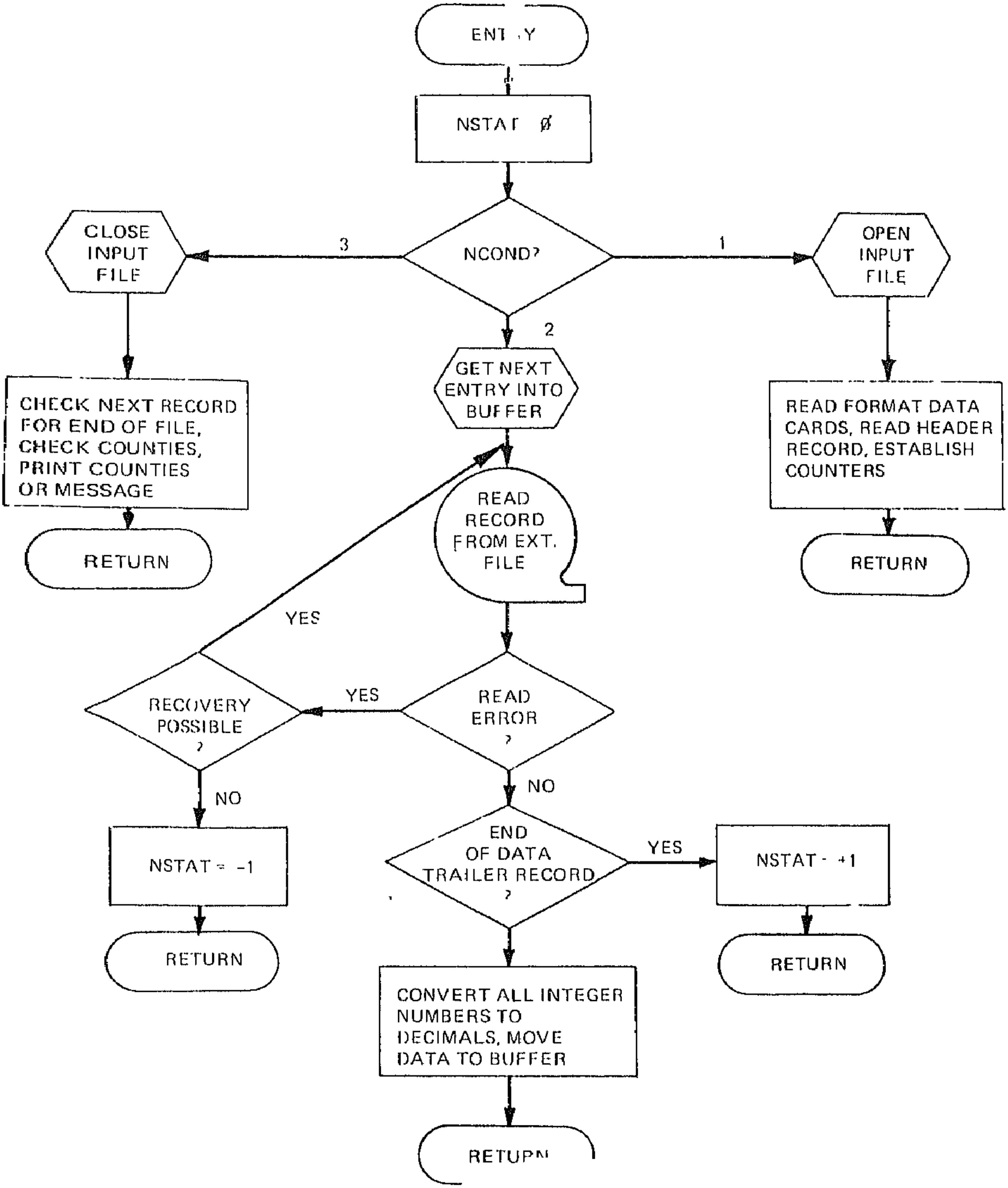


Figure D-2: Flov

```
      SUBROUTINE USERRD(NCOND,NSTAT,BUFFER,LENGTH,UNIT)
C
C     SUBROUTINE TO READ AN EXTERNAL BINARY DATA FILE FOR RAP.
C     ALL DATA ARE INTEGER NUMERICS EXCEPT FOR THE CROSS REFFRENCE CODE
C     IN WORDS 1 AND 2, WHICH IS ALPHA.
C        NCOND      OPERATION TO BE DONE
C                 1 OPEN FILE
C                 2 READ A RECORD INTO BUFFER
C                 3 CLOSE FILE
C        NSTAT      STATUS OF OPERATION
C                 0 NORMAL RETURN
C                +1 END OF DATA
C                -1 READ ERROR
C        BUFFER     WORK BUFFER OF 2000 WORDS
C        LENGTH     NUMBER OF WORDS EXPECTED BY RAP
C        UNIT       THE UNIT NAME LEFT JUSTIFIED IN THIS WORD
C
      DIMENSION BUFFER(2000)
      EQUIVALENCE (DECL,INT)
      NSTAT=0
      GO TO (100, 200, 300), NCOND
C
C     OPEN FILE, READ 13 WORD HEADER RECORD
C     CHECK LENGTH, HAS TO BE EQUAL TO 28
  100 IF(LENGTH.EQ.28) GO TO 105
      WRITE(6,101),LENGTH
  101 FORMAT(//,56H RECORD LENGTH INCORRECT, 28 WORDS DEFINED, RAP EXPEC
     1ITS ,I4)
      STOP ERROR
  105 CALL NTRAN(UNIT,2,13,BUFFER,L)
  110 IF(L+1) 900,110,120
C     CHECK L FOR LENGTH OF RECORD READ
  120 IF(L.EQ.13) RETURN
C
C     ERROR, HEADER RECORD MISSING, STOP RUN
      WRITE(6,130)
  130 FORMAT(//,40H ERROR, NO HEADER RECORD FOUND ON UNIT
      NSTAT=-1
      RETURN
C
C     READ A RECORD, 30 WORDS
  200 CALL NTRAN(UNIT,2,30,BUFFER,L)
  210 IF(L+1) 900,210,220
C     SKIP WORDS 3 AND 4, WHICH ARE NOT USED, CONVERT ALL NUMBERS TO DECIMALS
  220 DO 250 I=3,28
      DECL=BUFFER(I+2)
  250 BUFFER(I)=INT
      RETURN
C
C     CLOSE FILE, NO ACTION NECESSARY
  300 RETURN
C
C     STATUS NEGATIVE ON UNIT READ, CHECK FOR END-OF-FILE
  900 IF(L.EQ.-2) GO TO 920
C     READ ERROR
      NSTAT=-1
      RETURN
C
C     END OF FILE REACHED
  920 NSTAT=+1
      RETURN
      END
```

Figure D-3

to geographic coordinate transformation. PREPRC/GIRAS assumes that base maps are in the UTM projection. The GRID-standard file may then be input into GRID using runstreams described in the following sections. GIRAS files are generally produced with standard IBM tape-labelling at 1600 BPI density. PREPRC/GIRAS handles all label record manipulations.

Runstream to Preprocess a GIRAS Data Set

```
@RUN
@ASG,TVRJ   1,U9V,reel#              ° GIRAS Input File
@ASG,TVW    B,U9V,reel#              ° Preprocessed Output
@ASG,A      RID*GRID.                ° Program file containing
                                       PREPRC/GIRAS
@XQT,OU     RID*GRID.PREPRC/GIRAS
FILE04                               ° Directs preprocessor to
                                       operate on the fourth data
                                       set (Census County Subdivisions)
```

Sample Output From Preprocessor

The following pages show what output should be expected from a preprocessor runstream.

First, the map-header of the requested data set is printed. This contains a textual description of the data set, control point coordinates (digital and geographic) and other technical information which the preprocessor requires.

For each map section in the data set, the section-header is printed. In the example data set, there is only one map section.

The master map symbol to polygon attribute correspondence table, which is printed after sections are preprocessed, associates a unique 3-character master map symbol to each polygon attribute code. Attribute codes are stored on GRID-standard files as UNIVAC floating-point numbers. Two types of maps may be created from a preprocessed GIRAS data set--either a master map, directly from the master map symbols, or a real-valued map from the single attribute code. Both may be transformed into other types using R-Card sequences.

Next, a summary report is printed. Summary statistics should match information given in the map-header. Next, the data set name is printed. The preprocessor retrieves this name from the "data set identifier" field of the HDR1 label record preceding the map-header data. As the message indicates, the first twelve characters of this name must be recorded in Columns 3-14 of the D-Card in a subsequent GRID runstream used to process the GRID-standard file created by the GIRAS preprocessor.

A geographic window is then printed which gives the extreme geographic coordinates calculated for the entire map using the digital to geographic transformation. In order to display the entire map, the user should enter "clipping" coordinates on the D-Card which contain this window.

GRID Runstream to Process a Standardized GIRAS Data Set

The following is a batch runstream which shows the necessary EXEC-8 control language and GRID control cards for producing and displaying a master map from a standardized GIRAS data set:

MAP HEADER: KANSAS CITY, KAN-MO 1:250000 QUAD HYDROLOGIC UNITS

NUMBER OF ARC RECORDS(NA) IN MAP IS 36

NUMBER OF COORDINATES(NC) IN MAP IS 11928

NUMBER OF POLYGON RECORDS(NP) IN MAP IS 13

POINT TOLERANCE(PTL) IS	5	ARC LENGTH TOLERANCE(ATL) IS	15
NUMBER OF MAP SECTIONS(NSC) IS	1	MAP TYPE CODE(MTP) IS	10
LENGTH OF TEXT FILE(LTX) IS	0	MAP PROJECTION CODE(MPJ) IS	1
MAP SCALE(MSC) IS	250000	MAP DATE(MDA) IS	1973

MAP COORDINATES:					
	MINIMUM	X (XMN) IS	0	Y (YMN) IS	-70
	MAXIMUM	X (XMX) IS	27267	Y (YMX) IS	17485

MAP HEADER CONTROL POINTS

CONTROL POINT	COORDINATE TYPE	CONTROL POINT COORDINATES (DIGITIZER UNITS)	CONTROL POINT COORDINATES (LONGITUDE AND LATITUDE)
SW	X:LONGITUDE Y:LATITUDE	0 (SWX) 0 (SWY)	96 (SWLO) 39 (SWLA)
NW	X:LONGITUDE Y:LATITUDE	208 (NWX) 17485 (NWY)	96 (NWLO) 40 (NWLA)
NC	X:LONGITUDE Y:LATITUDE	0 (NCX) 0 (NCY)	0 (NCLO) 0 (NCLA)
NE	X:LONGITUDE Y:LATITUDE	27070 (NEX) 17465 (NEY)	94 (NELO) 40 (NELA)
SE	X:LONGITUDE Y:LATITUDE	27268 (SEX) 0 (SEY)	94 (SELO) 39 (SELA)
	X:LONGITUDE Y:LATITUDE	0 (SCX) 0 (SCY)	0 (SCLO) 0 (SCLA)

NUMBE[illegible] ED DATA(NAD) IS 0 LENGTH OF FAP FILE(LFP) IS

NUMBE[illegible] (NCH) IS 49 TITLE:KANSAS CITY,KAN-MO 1:250000 QUAD HYDROLOGIC UNITS

NOTE: [illegible] IN MAP HEADER, SEE LUDA DOCUMENT[illegible]ION

```
                              SECTION HEADER          1

SECTION NUMBER(SEC) IS                             1     NUMBER OF ARCS IN SECTION(NAS) IS                36
NUMBER OF COORDINATES IN SECTION(NCS) IS        5964     NUMBER OF POLYGONS IN SECTION(NPS) IS            13
LENGTH OF FILE ASSIGNING ARCS TO POLYGONS(LFS) IS 60     SECTION ERROR-FREE INDICATOR(MARK) IS             3

          SECTION COORDINATES:    MINIMUM   X (XMNS) IS       0    Y (YMNS) IS     -70
                                  MAXIMUM   X (XMXS) IS   27267    Y (YMXS) IS   17455

END OF SECTION         1 OUTPUT.
```

MASTER MAP SYMBOL TO POLYGON ATTRIBUTE CORRESPONDENCE TABLE

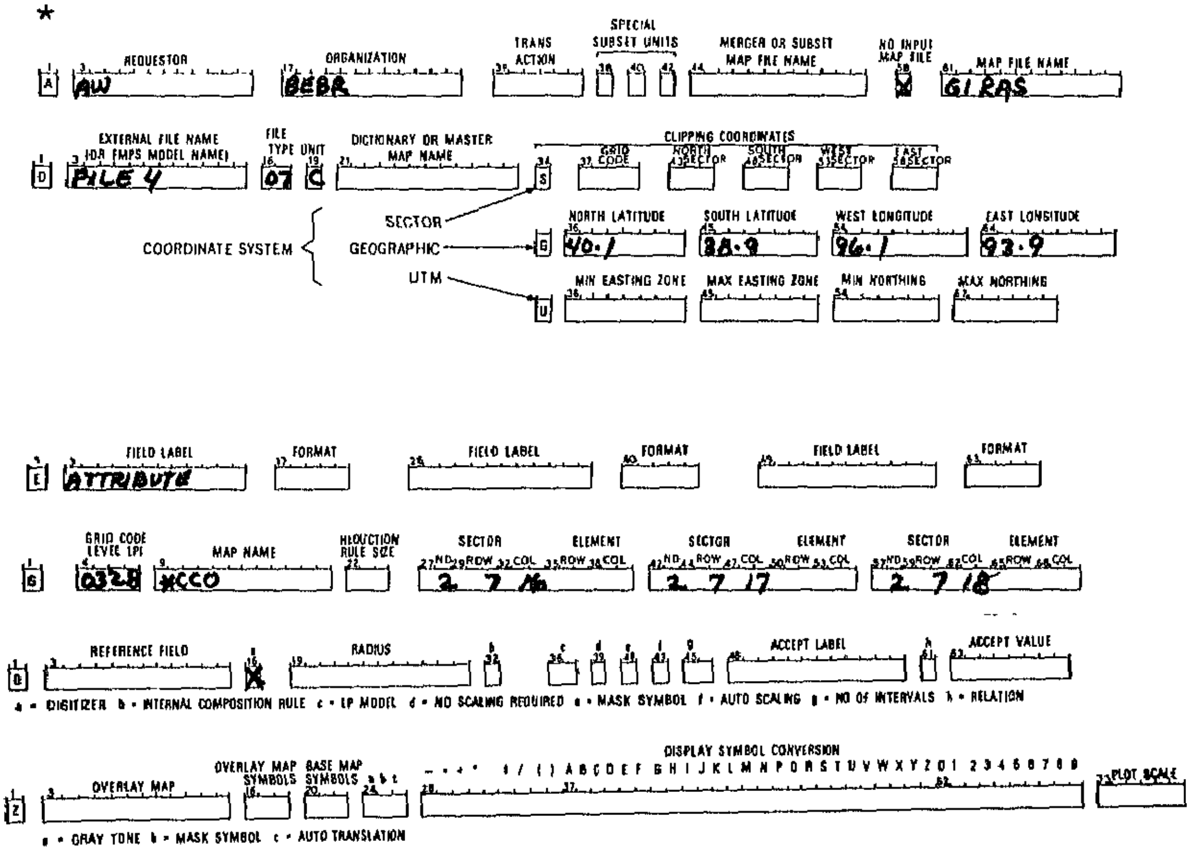
MASTER MAP SYMBOL	POLYGON ATTRIBUTE CODE
A--	10240005
B--	10240007
C--	10240008
D--	10240010
E--	10240011
F--	10240012
G--	10240013
H--	10270102
I--	10270103
J--	10270104
K--	10280101
L--	10300101

```
                         MAP SUMMARY STATISTICS


NUMBER OF POLYGONS PROCESSED THIS MAP IS            13   (      13 UNIQUE)

NUMBER OF ARCS PROCESSED THIS MAP IS                60   (      36 UNIQUE)

NUMBER OF COORDINATES PROCESSED THIS MAP IS      10668   (   11928 TOTAL)

EXTERNAL FILE NAME USED ON D CARD OF RAP RUNSTREAM (FIRST 12 CHARACTERS ONLY): FILE 3


                         MAP GEOGRAPHIC WINDOW

MAP COORDINATES:    MINIMUM   LONGITUDE IS 93.99989    LATITUDE IS 39.00012
                    MAXIMUM   LONGITUDE IS 96.00003    LATITUDE IS 40.00004
```

GRID Runstream to Process a Standardized GIRAS Data Set

The following is a batch runstream which shows the necessary EXEC-8 control language and GRID control cards producing and displaying a master map from a standardized GIRAS data set:

```
@RUN
@ASG,TVR    C,U9V,reel#     °Standardized File
@ASG,A      RID*GRID        °Assign Program File
@XQT,OU     RID*GRID.GRID
*
```




```
*
@FIN
```

The clipping coordinates and the data set name on the D-Card are taken from the preprocessor output.

An E-Card with one data name is necessary since all preprocessed GIRAS files are written with one attribute value.

The GRID sector rows and columns are calculated from the geographic window, using the method in Section A. (These and the clipping coordinates may possibly be more restrictive than the window if only a subarea needs to be mapped.)

Operational Notes

Preprocessed data may be written to mass-storage files instead of to tape (as is shown in the sample runstream). File assignments need only be changed. The internal (@USE) name, 'B', must be attached to the file in the preprocessor run.

If more than one data set on a GIRAS tape is to be preprocessed in a single runstream, the tape must be rewound prior to each execution of PREPRC/GIRAS. It is not currently possible to stack several preprocessed data sets onto one reel (or one mass-storage file); separate assignments must be made for each.

GIRAS tapes may be available without IBM Standard Labels. In order to process such a tape, use a 'B' option on the @XQT card. This directs the preprocessor to "bypass label processing." In this case no data set identifier will be recoverable; the preprocessor will then write an image of the "FILE∅n" input card onto the standardized file. The preprocessor runstream on A-9-9 assumes that the Census County Subdivision data set is written fourth in order on the file (same order as is given on A-9-6). Data may not necessarily be recorded in the same order on other GIRAS files. The user should establish the content and data ordering within any GIRAS file prior to running the preprocessor.

The source cited in footnote (2) gives documentation on the GIRAS file structure, system design, data content and coding. Familiarity with this and any other GIRAS related information available from USGS is recommended. Figure D-1 gives details on the GIRAS File Structure. A run time estimate for processing a map section within a GIRAS data set may be calculated by the following formula:

#SECONDS = (.005 X LFS) + (.00002 X LFS X NCS), where LFS and NCS are defined as in the section header.

<u>08 CENSUS - (DIGITIZED)</u>

° This category consists, presently, of the "DIMECO" county outline file (scale 1:500,000), which contains only geographic coordinate information, that is, no attributes exist on the file in conjunction with the county boundaries. Therefore, only a county master map may be created from this file.

<u>09 COMLUPS FORMATTED TAPES - (DIGITIZED)</u>

° An off-line preprocessor exists to standardize COMLUPS data for mapping in this system. (See "Handling Digitized Data" Section C.)

<u>10 F-CARDS - (DATA + DIGITIZED)</u>

° Allows immediate input of data and polygonal coordinates within GRID runstream (See "F-Cards").

<u>11 "OTHER" DIGITIZED DATA BASES</u>

° This is defined as any foreign data base containing polygonal coordinates, for which some programing is ne

process it in this system.

---

2) See William B. Mitchell, et al, GIRAS: A Geographic Information Retrieval and Analysis System for Handling Land Use and Land Cover Data, USGS, Geological Survey Paper 1059 (Washington, DC, Government Printing Office) 1977.

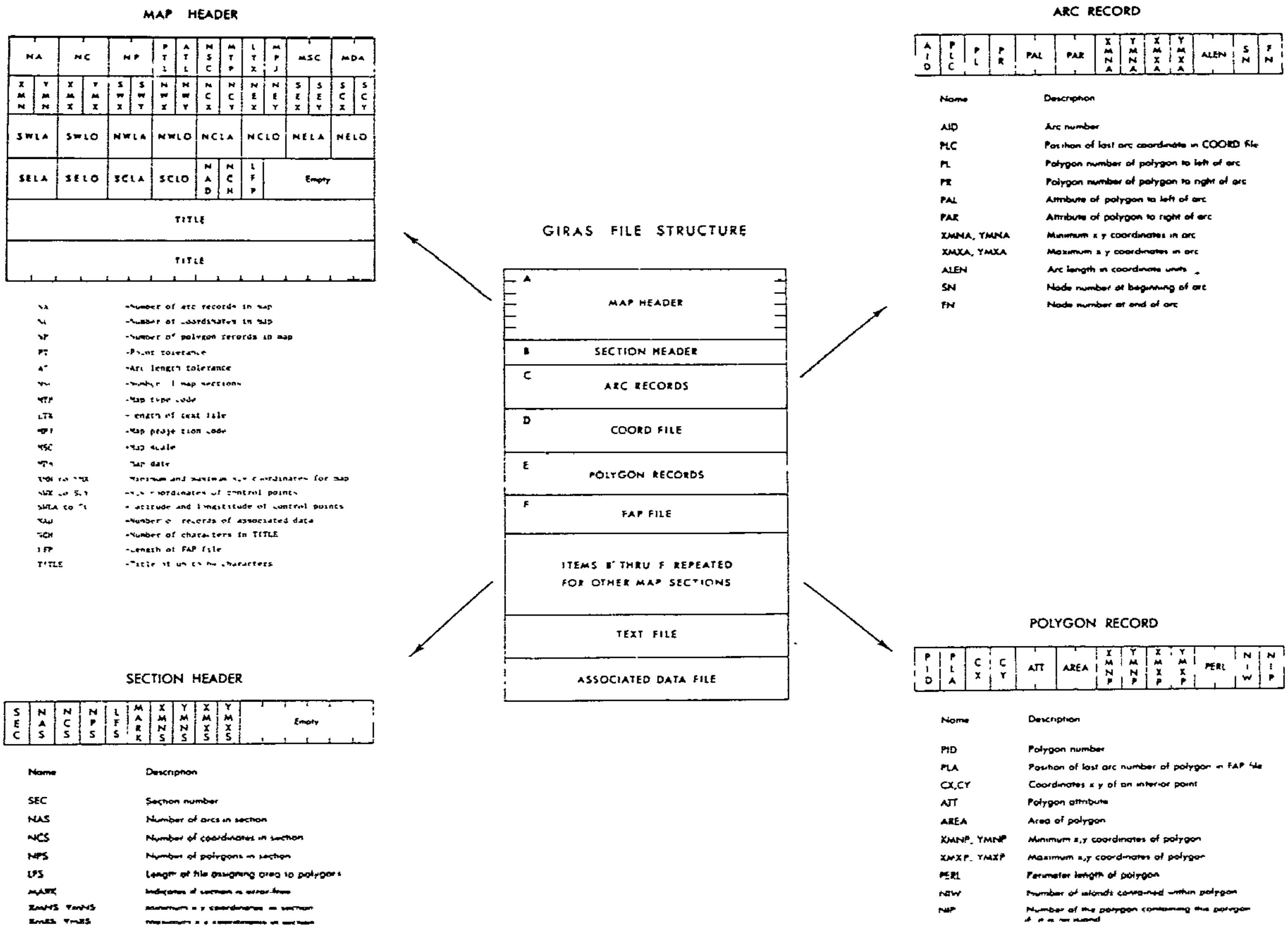


Figure D-1 GIRAS File Structure

It is the user's responsibility to produce system-standard files prior to input to the system. Briefly, he must insure that:

1. All coordinates written out are geographic.
2. The requisite information in the prefix for each feature is present--'master map' symbol, feature type, number of vertices, etc.
3. For a polygon, that the arcs or edges of its boundary are chanined such that the region of interest is always to the right (clockwise) or to the left (counterclockwise) of the arcs.
4. The file is properly closed after all features are written out.

The partial program, Figure D2, will help explain what is required. Also, there are subprograms in the system program file which the user will 'collect' with his own to perform the standardization and coordinate transformation.

Explanation of Variables

The common block, (USERDG) forces consecutive storage arrangement of the variables in it.

HDR - A 14-word header is written out on every standard file. The first two words must be as assigned in the program HDR (3) and HDR (4) will contain some text describing t user must code this text in the "enternal on the D-Card in order to pro

IDENT - Receives a master map symbol unique feature.

ITYPE - Feature type.

NVERT - Number of vertices (polygons

```
@FOR,IS  USER-PREP,USER-PREP
                     :
                     .
      COMMON /USERDG/ HDR(14),IDENT,ITYPE,NVERT,X0,Y0,
     $     XMIN,YMIN,XMAX,YMAX,VERTS(2,...),ATTRIB(...)
      DIMENSION PRE(9),OUT(1176)
      EQUIVALENCE (PRE,IDENT)
                     :
                     .  ANY USER STATEMENTS
                     .
      HDR(1) = 'USER'
      HDR(2) = 'PREPRC'
      HDR(3) = <SOME USER TEXT>
      HDR(4) = <SOME USER TEXT>
                     :
                     .  USER STATEMENTS
                     .
C         WRITE HEADER ON STANDARDIZED FILE.
C
      CALL INOUT (0,'B',HDR,14)
                     :
                     .  USER STATEMENTS TO READ IN DATA, PERFORM
                     .  COORDINATE TRANSFORMATIONS, CHAIN POLYGON ARCS,
                     :  SET NECESSARY VALUES IN PREFIX, COLLECT ATTRIBUTE
                     .  VALUES, ETC.
                     .
C         SEQUENCE FOR WRITING A POLYGON

      ITYPE = 1
      CALL STDIZE ('B',PRE,9,OUT)
      CALL STDIZE ('B',VERTS,2*(NVERT+1),OUT)
      CALL STDIZE ('B',ATTRIB,NATTRB,OUT)
                     :
                     :
                     .
C         SEQUENCE FOR WRITING AN ARC.
C
      ITYPE = 2
      CALL STDIZE ('B',PRE,3,OUT)
      CALL STDIZE ('B',VERTS,2*NVERT,OUT)
      CALL STDIZE ('B',ATTRIB,NATTRB,OUT)
                     .
                     :
                     .
C         SEQUENCE FOR WRITING A POINT.
C
      ITYPE = 3
      CALL STDIZE ('B',PRE,2,OUT)
      CALL STDIZE ('B',VERTS,2,OUT)
      CALL STDIZE ('B',ATTRIB,NATTRB,OUT)
```

Figure D-2   USER PROGRAMS and RUNSTREAM   (NEXT PAGE)

```
                          .
                          :
                          : GET DATA FOR ANOTHER FEATURE, UNTIL EOF
                          :
                          .
C           CLOSE STANDARDIZED FILE.
      CALL STDIZF ('B',-1,-1,OUT)
                          :
                          :
                          .
      STOP
      END

@MAP,I   ,,USER-PREP      .
 IN USER-PREP             :
 LIB RAP-FILE.            . FILE CONTAINING RAP PROGRAMS (MUST BE @PREP'ED)
 END
@XQT,CU  USER-PREP
        .
        . ANY NECESSARY INPUT CARDS
        .
@FIN
```

XO,YO - Interior point coordinates of polygon

XMIN... - Coordinate extent of polygon

YMAX

VERTS - A two-dimensional array, sufficiently large enough to contain all the vertices of any polygon in the file.

VERTS (1, I) = Longitude_I

VERTS (2, I) = Latitude_I

OUT - "STDIZE" uses this to buffer the data as it is written out

ATTRIB - Array containing the attribute value(s) for a feature

NATTRB - Number of attributes per feature

Coordinate Transformation--Digitizer to Geographic

In the event that the user's digitized data originates from source maps in the UTM projection, he may use this sequence at the beginning of his program to set up the transformation:

```
CALL D2GINT
CALL D2UBLD
```

D2GINT reads in the fiducial (registration) points for the data, and also the geographic coordinates of the boundary of the source map via:

```
NAMELIST/ FIDUC/
LNG1, LAT1, LNG2, LAT2, LNG3, LAT3,
IX1, IY1, IX2, IY2, IX3, IY3
            TOLER
```

LNG1, LAT1, . . ., LNG3, LAT3 (real) are the geographic coordinates of the fiducials,

IX1, IY1, . . ., IX3, IY3 (integer) are the digitizer coordinates of the same fiducials, given in thousandths of an inch,

TOLER is equal point tolerance in inches.

Three fiducial coordinates are usually necessary to inform D2UBLD of the orientation of the source map.

The user's NAMELIST input should appear immediately after @XQT (unless he reads in other cards prior to the call to D2GINT); e.g.,

@XQT,OU USER-PREP

$FIDUC

LNG1 = 71., LAT1 = 42., LNG2 = 73., LAT2 = 42.,

1X1 = 0, 1Y1 = 0, 1X2 = 403, 1Y2 = 34557, 1X3 = 25185, 193 = 0

ORNTX = 0, -1, ORNTY = 1,0

$END

CALL DIG2G (GEOG, IDIG, N)

will transform the N pairs of digitizer coordinates in the two-dimensional array, IDIG (integer) into N pairs of geographic coordinates in the array, GEOG. IDIG must be ordered, (X,Y). In his program, the user would declare:

DIMENSION GEOG (2,N), IDIG (2,N)

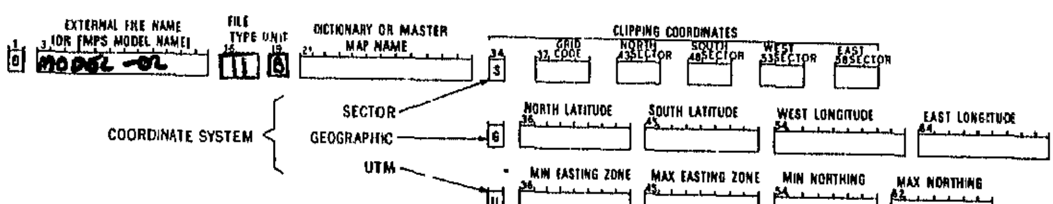
where N should be replaced by an integer or a parameter variable.

12 PLOT FORMATTED TAPES - (DIGITIZED)

° An off-line preprocessor exists to standardize PLOT data for mapping in this system. (See "Processing Polygon Digitized Data In Grid System, Section D.)

13 - 99 UNASSIGNED INDICES

Column 19 must contain a single-character internal unit name (which appears on either a @ASG or an @USE Card). For FORTRAN files and FMPS files this must be an numeric entry; for other files, it may be numeric or alpha.



Dictionary

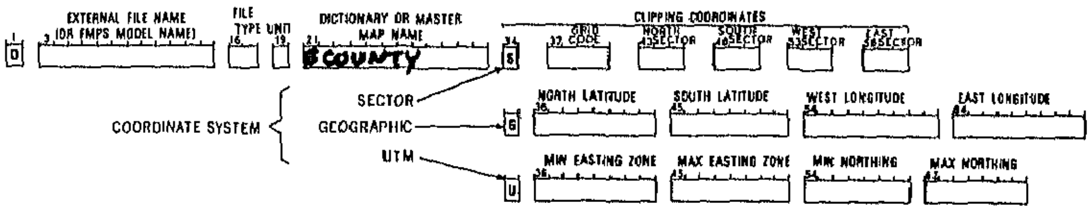
This field is to be used in conjunction with file types 01 through 06 only. For data items arriving without digitized polygonal areas, an appropriate map dictionary must be referenced. The name always begins with a $ and must correspond to the desired master map name containing the same characters in position 2 through 12 of the name. An example:

POSITION 2

$TIMBER = DICTIONARY NAME

*TIMBER = MASTER MAP NAME

If the data field references an aggregate area dictionary, the last three characters of the dictionary name must reference the appropriate aggregate area dictionary suffix.



Clipping Coordinates

To minimize the processing time associated with external data, it may be necessary to limit the study area to that which is of interest to the user. This is accomplished through the use of clipping coordinates.

Type of Clipping Coordinates

Column 34 must indicate the coordinate system used as clipping coordinates. The valid entries are 'S' for sector coordinate, 'G' for geographical coordinate system and 'U' for UTM coordinate system. Whiever is indicated will determine the manner in which the remainder of the card is interpreted.

Sector Coordinate System

Columns 37 through 40 must contain the grid code of the clipping coordinate system. The next four fields indicate the northern sector row, southern sector row, western sector column and the eastern sector column. If the same sector is both northern and southern boundary then the same number is entered in both north and south boundary. South boundary row must be greater than or equal to northern sector boundary. Eastern column boundary must also be greater than or equal to the western boundary.

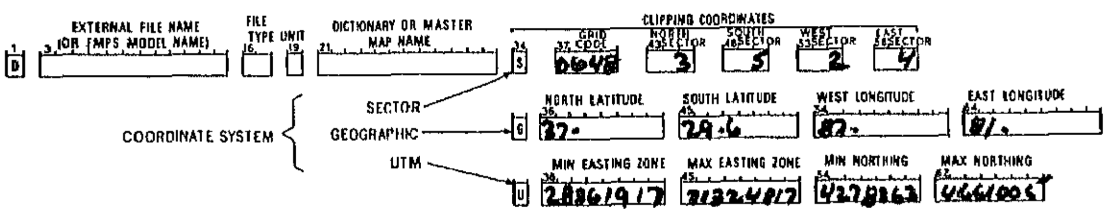
Geographic Coordinate System

The maximum latitude (north boundary) is entered first with decimal point indicated, followed by the minimum latitude (south boundary). Maximum longitude (west boundary), followed by minimum longitude (east boundary), come next. This coordinate system is immediately converted to the sector system upon entering the GRID Processor.

If any portion of a sector is included within the clipping coordinates indicated by the geographic coordinate system, then the entire sector is included. Thus, clipping is along sector borders eventually. Decimal point must be included on all coordinates.

UTM Coordinate System

The minimum UTM easting coordinate (west-boundary) is followed by the UTM zone which contains the west boundary. Next is the maximum UTM easting coordinate (east boundary) and its zone. Minimum northing coordinate (south border) followed by maximum northing coordinate (north boundary) are the last two entries made on this card. Decimal points must be entered or assumed to follow the last digit. UTM is converted to sector coordinate system with the same rules applying here as on the geographic conversion.



Field Label

The E-card enables field labels to be assigned to each of the input data fields. The names used will eventually be referenced on Q-cards to generate maps. A variable number of E-cards may be used to describe a data file. Generally, once a file has been defined, the set of E-cards is retained by the user for future runs with the same data file.

With the exception of FMPS files and COMLUP formatted tape files E-card entries must list the data items in each record and must appear in the same order as the data appears physically. For FMPS files, the user enters only those items that he intends to map.

When using COMLUP formatted tape files the E-card is required but only the field label portion of the card is used. The word REQUIRED placed in this field will be sufficient. The format field is not used.

Format

This field is only used for FORTRAN formatted files. Using a FORTRAN formatted file, the format fields are used to specify the type and size of each input field. Permissible types are:

A = alpha

I = integer

D or F = decimal

S or X = skip

The values must be placed relative to the system generated decimal point with whole numbers being to the left and decimal portions to the right. For example, if the input file contains two integer fields, each 6 characters long, followed by a space of 3 characters, an integer field of 5 characters and a decimal field of 3 characters, the fields will be filled out as indicated below.

1	3 FIELD LABEL	17 FORMAT	26 FIELD LABEL	40 FORMAT	49 FIELD LABEL	63 FORMAT
E	TIMBER	I 6.	SOILS	I 6.		.
E	SLOPE	I 5.	BOUNDARY	D 3.1		.

The format for decimal numbers must be described by the total field width which specifies the number of characters, including a sign and/or a decimal point if present, and the field width of the fractional portion, i.e., if the number is 12.3 it might be stored and 123 or 12.3 or +12.3, etc., in which case the format would be D3.1, D4.1, D5.1 respectively. Note that the alpha designator is for a cross-reference by symbol.

Data appearing on F-cards is processed in this system similarly to other external files; the user described format and order of appearance of the data has to be described on E-cards. F-cards allow polygonal coordinates to be input along with any associated attributes. The coordinates must be geographic (longitude, latitude), and all attribute names must precede any coordinates. If no attribute feature appears on the F-cards with the polygonal data, then a cross-reference link must appear; this is needed so the data may be linked to the proper geographic areas in the master map.

Feature Type

The feature type, column 3, pertains to digitized features (if none, leave blank). Use with file type 10 only, never with Type 05. Three types are recognized:

Column 3

1 - Closed Polygon. Coordinates must be in clockwise or counterclockwise order; each coordinate pair is ordered longitude, latitude. The last coordinate must be identical to the first.

2 - Arc (open polygon)

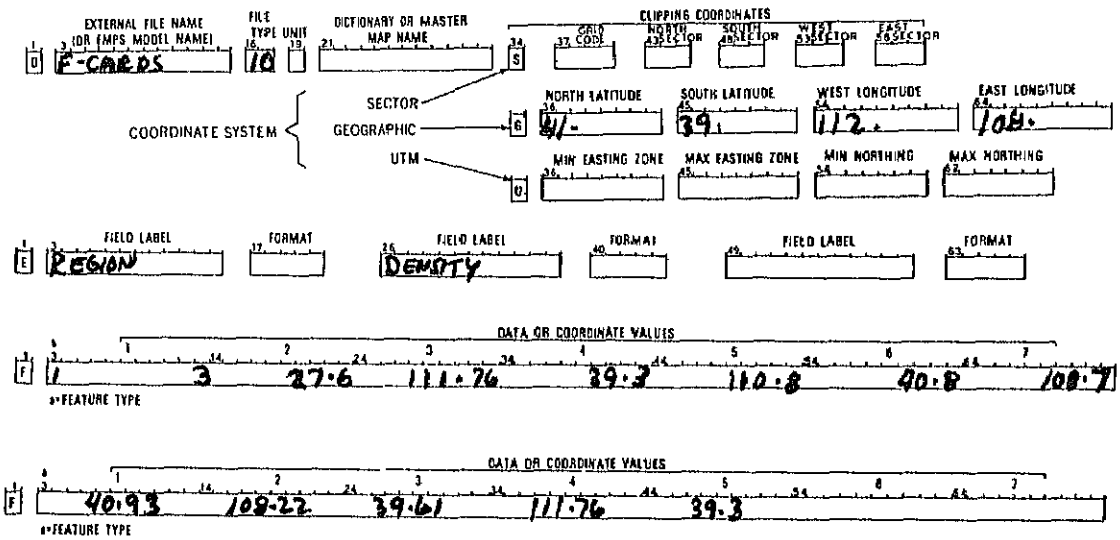
3 - Single Vertex or Point

Data Fields

There are seven data fields on the F-cards, columns 4 through 73. Each field may contain a maximum of 10 characters. In these fields, the user enters either attribute values, polygon coordinates, or cross-reference information.

For every feature which is to be mapped, the user must enter as many attribute values on the F-card as there are field tables on the E-cards. These attribute values must be real numbers. The feature

type code (column 3) is entered only on the first card of each set. F-cards may be used only in conjunction with D and E-cards, which are necessary to define the file, to indicate the type of cross-referencing, and name the dictionary for that cross-reference. Use of digitized data constitutes an immediate form of cross-referencing. A sample runstream showing the appropriate entries on the D, E and F-Cards now follows:



On the D-card, note that "F-CARDS" have been coded in the external file name field--this is not required, but does give a reminder of the data source. File type "10", which indicates F-cards (digitized), has been indicated. No unit name or dictionary name is necessary. Geographic clipping coordinates have been entered. These are necessary even though the user wishes to map his entire file. The E-card specifies that two attributes, "REGION" and "DENSITY" will be associated with each feature. The feature type on the first F-card, column 3, is '1' indicating a closed polygon. The first two data entries are attribute values.

The 3 in the first field goes with the field label Region and the 27.6 in the second field is the density. The remainder are polygon coordinates, continued to the next card.

Another F-card set would follow for the next feature.

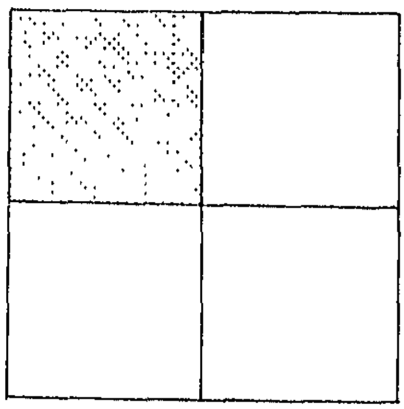
See section on Q-cards for an explanation of procedure for mapping this data.

G-CARD MAP DEFINITION

The Map Definition Card provides a unique identification for the map being prepared.

Grid Code

Since sectors of various sizes may have the same row and column designation along with equal names, they are separated by designating a grid code. A grid code is merely a numeric means of separating the various maps, depending on the amount of area covered.



Both the shaded sector and the larger sector have the same sector row and column designation, but cover different area sizes.

The grid code is divided into two parts: level, and lines-per-inch. The level refers to the relative size of the elements within the map. See Table 2, Section A for correspondence between level designation and map scale. The second part, lines-per-inch (8 or 6) is dependent on the configuration of the available line printer equipment. The system can take advantage of this to minimize distortion. At 6 lines-per-inch a map sector is displayed at 120 by 90 elements. At 8 lines-per-inch a map sector is displayed at 120 by 120 elements. It is not possible to create an 8 lines-per-inch map from a 6, or vice versa.

Map Name

This field is used to designate the name of the map being manipulated. The map name field may contain up to 12 alphanumeric characters designating the particular map being manipulated. All alpha map names must begin with a dot (.); names of master maps must begin with an asterisk (*); names of numeric maps must begin with a pound-sign (#); real-valued maps with an equals sign (=); boundary maps with a hyphen (-); and titles and scales with a colon (:). Map names chosen should relate meaningful information such as a real-valued map depicting rainfall for 1973 might be designated =RAIN1973, or a county map designated as *COUNTY.

If a master map *COUNTY was created then an existing dictionary would have the same name except for the first character, i.e., $COUNTY. The master map name should not exceed 9 characters in length instead of the normal 12 characters. This is to facilitate the use of dictionary aggregate area definitions. A dictionary name is a combination of the 9 characters in the dictionary field in addition to the 3 characters of the Aggregate Area Dictionary Suffixes. The combination comprises the normal 12-character name. If when referencing a dictionary, the last 3 characters are blank, the program assumes that the basic area definitions are being referenced and not the aggregate areas.

Sector Size Reduction

Normally, this field is left blank. If, however, the output sector map is to cover an area larger than the stored sector map, the size of the sector desired should be placed in this box. The first position, column 22, must indicate the method for combining the desired sectors and can contain 'A' or 'M' or 'P'.

'A' stands for average rule; this rule is only valid for numeric and real-valued maps. The values of the map cells to be combined are

first added together and then divided by the number of entries to obtain their average.

'M' represents modal rule; the concerned cells are tested to find the modal value and this value is placed in the representative cell. In the place of 'A', the system will default to the precedence table. The default values in the table are in descending order as follows:

9876543210AB

CDEFGHIJKLMN

PQRSTUVWXYZ

-=+*,$/()

'P' stands for precedence table entry. All cell values to be combined are assigned a value from the precedence table and then the symbol with highest precedence is chosen for inclusion into the representative cell (See X-card for changing precedence table). For example, if it is desired to reduce sectors into the same 12Ø x 12Ø print positions of an output map,

Column 22 = A or M or P

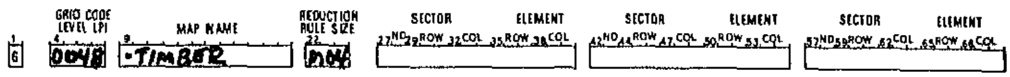
A = Average   M = Modal   P = Precedence

a sector size of Ø4 would be entered specifying that the output sector is comprised of four input sectors. Legitimate sector size codes must be the square of a positive integer number.

LINES/INCH			SIZE CODES	
6 & 8	2^2	=	Ø4	4 stored sectors summariz output sector
6 & 8	3^2	=	Ø9	9 stored sectors summariz output sector
8	4^2	=	16	16 stored sectors summari output sector

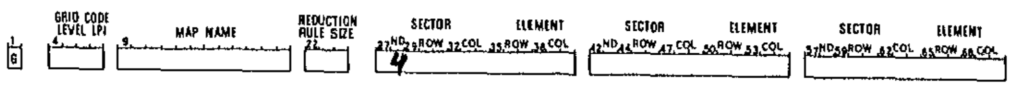
6 & 8	5^2	=	25	25 stored sectors summarized into 1 output sector
6 & 8	6^2	=	36	36 stored sectors summarized into 1 output sector
8	8^2	=	64	64 stored sectors summarized into 1 output sector

All codes can be used for 8 lines-per-inch; only 04, 09, 25, and 36 can be used if 6 lines-per-inch.



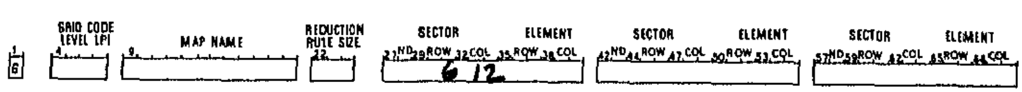
Number Down (No. Dn.)

This field is normally left blank. If, however, it is desired to perform topic generation or display definition on a strip of sectors in the north-south direction, the number of sectors in the north-south direction should be entered in this field.



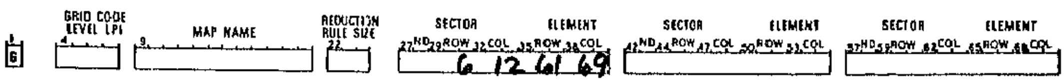
Sector Row and Column

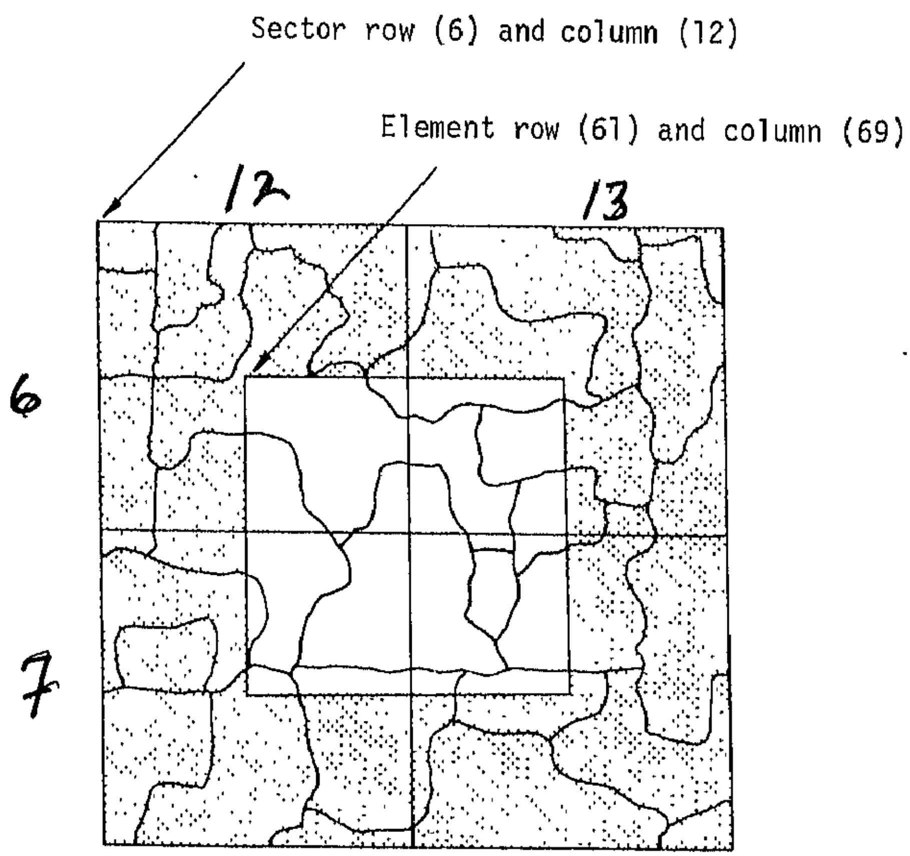
The two fields designated as sector row and sector column provide a means of identifying a specific map sector. Normally sectors will be designated by suing only the sector row and column fields. To reference a second sector, not adjacent in the north-south direction, use the next sector row and column fields.



Element Row and Column (For Display Purposes Only)

An output map equivalent to the stored map will be generated if the element row and column is left blank. If, however, it is desired to display a sector map whose geographic area does not have the same reference point as that of a stored sector, entries in the element row and column fields can be made. An output map will be generated for output only consisting of portions of each stored sector which falls within the boundaries of the new sector requested.





NEW SECTOR DISPLAY ONLY

H-CARD TEXT OVERLAY

It is often desirable to overlay short <u>text</u> statements within the body of a map to assist in interpretation of the display. Use of the H-card allows this capability. Any number of H-cards may be used.

<u>Row and Column</u>

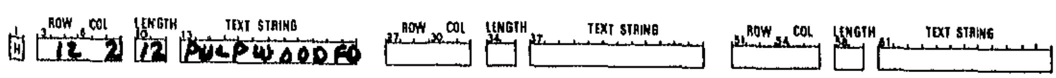
The element row and column where the text is to originate are entered in these fields. The entries must all be numeric and right-justified. Note that when using the text overlay option only <u>one</u> sector can be specified in the G-card.

<u>Length in Characters</u>

This field is used to designate the length of the text to be printed. This field must be numeric and can vary from 1 to 12. If a number is specified which is larger than 12, the text will be truncated at 12 characters regardless. If more characters are specified than can be accommodated due to the boundary limits of the sector, the text characters which exceed the sector boundaries will also be truncated.

<u>Text</u>

This field is used to specify the actual text to be displayed on the output topic map. If fewer characters of text are entered than indicated in the "length" field, the remaining field will be filled with blanks on the map. The text begins at the row and column point indicated and extends horizontally to the right.



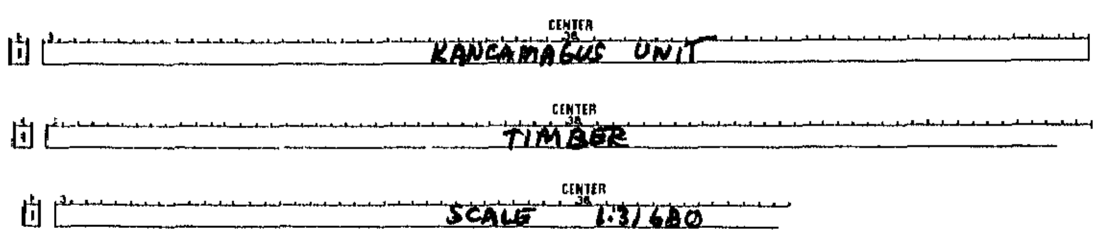
I-CARD TITLE

All maps should have a title. Since new maps do not have titles stored, they must be supplied when generating new maps. This is accomplished by specifying the map name on the "G"-card and the title on the "I"-cards.

Title

The title, Columns 3 through 72 of the I-cards, is an alphanumeric free form entry. Free form means that whatever is placed in this field is used directly on the output maps without modification and, therefore, the field is not restricted by any conventions. These fields should be used to provide a descriptive and unique map title, properly spaced, using the center line as a spacing guide. Examples of possible usage are: notes regarding the data source, a verbal description of the map contents, or any information the user feels will enhance the map.

If the information is the title of a composited map, the text supplied should include a description of what is being combined. A maximum of 30 cards may be used.



These cards provide a means for scaling the initial values of data to the symbol display range of the mapping system. (Alternatives are discussed with the Q-card.) A maximum of 35 J-cards can be included for a specific topic.

To avoid weighting the map data as they are being recorded (reserving this role for the compositing expressions or symbol conversions) it is necessary to center the distribution on a common value. The value 5 on the scale Ø to 9 is used for the mean of each factor distribution. Avoid undue influence by extreme variations of data. One method of smoothing in socio-economic data is to state it as per capita values. Another smoothing which is useful when the data are approximately normally distributed, is to compute the standard deviation and use it to control stratification of data.

Category Name

Each name which describes a range of values or a category is entered in columns 3 through 50 of the J-card. These names are not used specifically for reference at any point in the system and, therefore, can be free form. The category names will appear as part of the map heading along with the symbol and associated range of values.

Symbol

The symbol entry is used to enter the map symbol of the category described above. It may be alpha or numeric, however, if it is alpha, the map name has to begin with a dot (.) as the first character.

Thresholds

Each set of threshold values provides the boundaries within which the input data values will be set to a constant map symbol. The lower threshold represents the smallest value which will be set equal to

a constant map value and the upper threshold represents the first value which <u>will not</u> be set equal to this particular map value. Thus, a given number must be equal to or greater than the lower threshold and less than the upper threshold to fall within the category range. It is normal for the upper threshold for one map symbol to be equal to the lower threshold for the next larger map symbol.

If the lower threshold of the smallest category is left blank, the symbol for the smallest category will be inserted for all numbers less than the upper threshold for this smallest category. That is, if the smallest threshold value was 1,ØØØ, all values less than 1,ØØØ including negative numbers would be set to the symbol of the smallest category. If a specific number is inserted in the lower threshold of the smallest category, all numbers which are less than this number, will be flagged as an error. The same philosophy holds true for the largest category. All numbers greater than the lower threshold of the largest category will be set equal to the symbol of the largest category unless the field for the upper threshold is filled in. In this case, all numbers greater than the upper threshold of the largest category will be flagged as an error.

The categories defined must cover all possible input data values. If an input value occurs which does not correspond to an established category, an error will be generated.

	DESCRIPTIVE TEXT	SYMBOL	THRESHOLDS LOWER (GE)	UPPER (LT)
J	TIMBER DENSITY LESS THAN 10 PERCENT	[illegible]		10.
J	10 - 50 PERCENT	[illegible]	10.	50.
J	GREATER THAN 50 PERCENT	[illegible]	50.	

The K-card allows for the generation of new maps which may be created from (existing) maps. The name of the map to be created appears in columns 8 through 19 of the G-card. The new map is set equal to the reference map designated in columns 3 through 14 of the K-card. The values of the reference map (which appear above the blanks) may be replaced by the values designated in columns 24 through 67.

Reference Map

The reference map may be either numeric or alpha, or master and may have been previously stored or newly created. Equal map names cannot appear in both the "map name" field of the G-card and the "reference map" field of the K-card, unless a MODIFY transaction is occurring. In all other cases, an error message will be generated.

Mask

The "mask" field is used to assign 2 masking maps. The new map will be created with the sixth character in the field being used as both mask and replacing symbol. This field takes precedence over the "conversion symbols" field.

Symbols Conversions

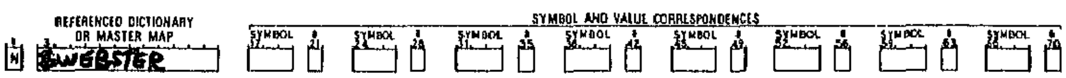
To create new maps from existing maps the symbols of the reference map preprinted on the form are replaced by the designated symbols entered in the blank spaces underneath the preprinted characters. A symbol must be supplied for every symbol of the reference map. If a symbol is present on a reference map for which a new symbol is not supplied, an error message will result.

N-CARD MAP GENERATION BY DICTIONARY SYMBOL CONVERSION

If the desired map to be generated is based upon areas defined in a dictionary, use of the N-cards is required. In this case, dictionary symbols are converted to the desired new symbols or values.

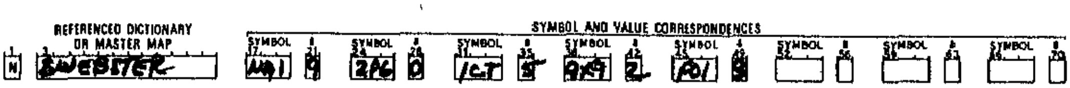
Reference Dictionary

The dictionary to be referenced when creating the new map is entered in columns 3 through 14 of the N-card. The creation of new maps can also reference the aggregate area coding of the dictionary. If, for example, counties were the entities defined in the dictionary, with regions as one of the coded aggregate areas, a new map could be created where the symbols of the aggregate area are converted to the desired symbols of the new map. The new map would then depict data conforming to region blocks.



Symbol

Area symbols are comprised of three characters: a 1-character alphanumeric prefix, and a 2-character alphanumeric suffix. The valid prefix symbols are the same as those listed on the K-card and are seen on master maps. The suffix characters are defined in the dictionary. The symbol characters to be used on the N-card must match the characters assigned to the area in the reference dictionary, i.e., if the area has been designated as "FØ1" in the referenced dictionary, the symbol assigned on the L-card must also be "FØ1."



Value

The value replacing the dictionary symbols may be alpha or numeric, but the name of the map to be generated (as specified on the G-card) must follow the appropriate naming convention.

O-CARD MAP GENERATION BY POINTS OR LINES

The O-cards provide the facility of generating maps by defining data points or data lines within the study area with associated values. After all the values have been defined, an equation is used to generate a contour (continuous) or equidistant (proximal) map of the area. The exact outcome of the map depends upon the equation chosen. Note that only one sector may be specified on the corresponding G-card when generating topics by points or lines.

Formula Number

The formula number entry refers to the internal calculations to be performed by the system. There are four possible entries;

1 = Continuous generation by points

2 = Proximal generation by points

3 = Continuous generation by lines

4 = Proximal generation by lines

One must be entered in column 16.

Dispersion Global

The dispersion value may range from 0 through 9 and the effect varies as listed below:

0 = Point or line has no influence.

1 = Normal case. No special consideration.

2 = Effect of value is limited to approximately 96 elements.

3 = Effect of value is limited to approximately 64 elements.

4 = Effect of value is limited to approximately 48 elements.

5 = Effect of value is limited to approximately 38 elements.

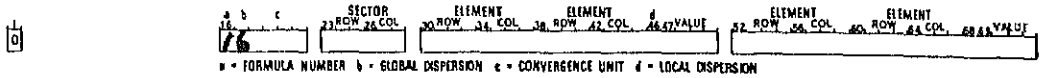
6 = Effect of value is limited to approximately 32 elements.

7 = Effect of value is limited to approximately 27 elements.

8 = Effect of value is limited to approximately 24 elements.

9 = Effect of value is limited to approximately 21 elements.

This specification of dispersion is "global" in that it applies to all points or lines except those for which a separate dispersion has been specified.



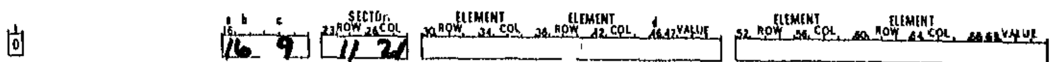
a - FORMULA NUMBER b - GLOBAL DISPERSION c - CONVERGENCE UNIT d - LOCAL DISPERSION

Convergence Limit

The convergence limit provides a background value for the created map. This is a non-sealed number. When the dispersion value is set to 1, then the conversion limit would have no effect. A generated map element is given this value whenever, due to the effects of dispersion, the element is not influenced by any of the points of lines. Columns 18 through 21 contain the convergence limit.

Reference Sector Row and Column

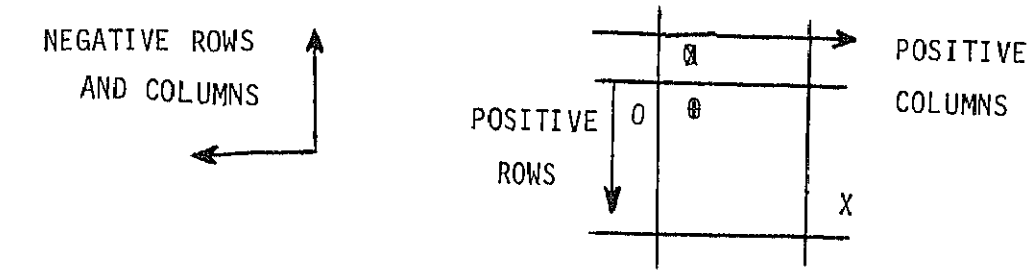
The reference sector specifies the map sector to which all point or line coordinates are relative. When this field is blank, coordinates are assumed to be relative to the current sector.



a - FORMULA NUMBER b - GLOBAL DISPERSION c - CONVERGENCE UNIT d - LOCAL DISPERSION

Point/Line Definition (Row and Column)

Values for the point and line map generation are entered in the appropriate positions. If map generation by points is requested, then a starting and ending point must be specified. If map generation by lines is requested, then both the starting row and column fields and the ending row and column fields must be specified. Dispersion is required only if it is desired to be different than the global dispersion. A value is required in all cases.



⊕ +10 +10 Positive Row, Positive Column, Inside

Ø -10 +10 Negative Row, Positive Column, Outside

0 +10 -10 Positive Row, Negative Column, Outside

X +100 +130 Positive Row, Positive Column, Outside

Sign Values for Point Entries

Figure 0-1

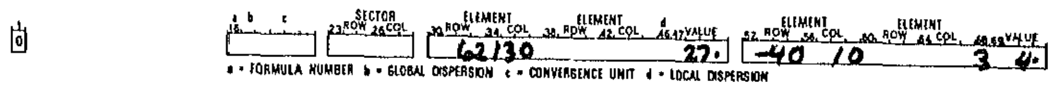
The row and column entries are a reference to the specific element associated with the data values. The entries to be made are numeric in all cases and, therefore, must be right-justified. If the value to be referenced to a sector all fall within the boundaries of the sector specified on the G-Card, entries do not have to be made in the sign fields. If, however, the data values were collected at points outside the boundaries of the sector specified, a sign indicating a negative direction will have to be supplied in some cases. All points have a row and column designation in relation to the northwest corner of the sector being mapped. The sign fields for rows and columns is used as shown above.

Dispersion (local)

The local dispersion operates the same as the global dispersion except the value is only applied to the specific data value it accompanies. All values must have either a local or global dispersion specified--refer to global dispersion for specific values, columns 46 and 68.

Values

The value of the data corresponding to the row and column location within the sector is entered in the value field. This must always be a numeric entry. However, it need not be right-adjusted if a decimal point is supplied. The value entries may be either scaled or non-scaled. If non-scaled numbers are used, then appropriate J-cards must be supplied with the run.



P-CARD GENERATION BY ELEMENT MATRIX

Using the element matrix, P-cards, maps may be generated. The geographic outlines of all areas within a sector have to be placed on a P-card matrix. All elements with equal values must be designated by the same symbols, which can be either numeric or alpha. A preceding G-card then indicates through the name of such a map the presence of numeric or alpha symbols or both. Note that only one sector may be specified on the corresponding G-card when generating maps by element matrix.

To generate maps by element matrix, the area boundaries are placed on a P-card matrix and each area is assigned a symbol. The method of assigning symbols is arbitrary, however, adjacent areas must not have equal symbols. When assigning symbols, equal symbols should be kept as far apart as possible. This rule also applies when crossing sectors. Areas which appear in more than one sector must have equal symbols in each sector, i.e., if a county is designated as "L" and a sector borderline cuts through it, it must be designated as "L" in both sectors. To eliminate problem areas between sectors, it is often wise to assign numeric symbols to all border areas and assign alpha symbols to all other areas, although this is not a system requirement.

When a <u>map dictionary</u> is used, each area is assigned a 3-character symbol: the first character (symbol prefix) is used for display and to define the geographic shape on the P-cards, the second and third characters (symbol suffix) are used to define an area uniquely.
Note that such a map will define the geographic shape of the basic area as defined in the associated dictionary and not the aggregate areas. This must be indicated in the name which has to equal the

9-character dictionary name except for the first character. A map of an aggregate area can be generated by reference only and not through the use of the element matrix.

Row Number

The row number field is to be used to designate each individual line within a sector numbered from 001 to 120 for 8 or 10-character-per-inch maps and 001 to 090 for 6-chracter-per-inch maps. If each line is unique, the numbers 001 through 120 or 001 through 090 will appear in columns 3 through 5 (the start column) of the left-hand cards and in columns 63 through 65 of the right-hand cards. If consecutive lines are identical they may be described on one card using the start and end columns to indicate the row number of the first and last identical row. This option is available for either the left or the right-hand cards.

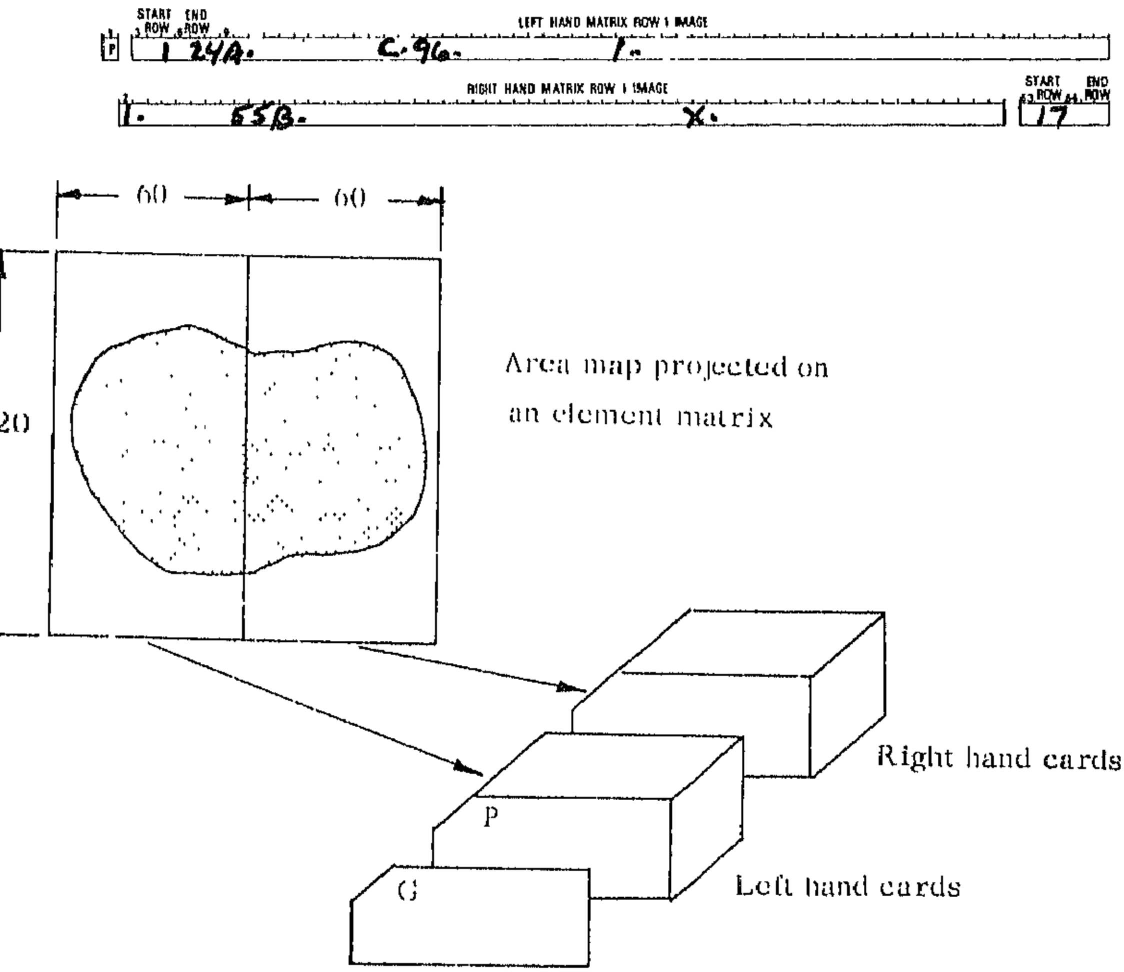
Print Positions

At any point in the data matrix with the exception of the first data position of each left and right-hand card, a period (.) may be used to indicate the column reptition of the previous data value until a new data value in the same row is encountered. Using this technique, the insertion of a "7" in column 9 and a period (.) in column 10 would yield an entire line of 7's for print positions 1 through 60. (Note that the symbol is not continued through to column 120 and must be redefined on the right-hand card.)

There cannot be any elements unaccounted for when creating a map. Each element must contain a valid character or have a valid character designated through use of the period (.) option. If an element is unaccounted for, an error message will result. Further, all rows must be accounted for, either as unique line entries or through use of the column "start to end" option on both the left-hand and right-hand

cards. A maximum of 120 left-hand and 120 right-hand cards may be used for an 8 or 10 row-per-inch map, 90 left and 90 right for 6-character-per-inch maps.

When assembling the resultant deck, all left-hand cards must precede the right-hand cards (Figure P-1).



Input Sequence

Figure P-1

Q-CARD TOPIC GENERATION BY EXTERNAL DATA

The Q-card is used in conjunction with an external data file defined on D and E-cards. Each of the data fields are defined on the E-cards. A given field which is to be mapped is referenced on the Q-card, and the appropriate action is taken to cause a map of the data to be created.

Once the data fields have been defined, it is necessary to indicate which sectors are to have maps created; the sectors are defined on a G-card. Since the incoming data may encompass more than the specified sectors or less than the specified sectors, two possible situations present themselves:

1. There are more data than required for the specified sectors. In this case, the extra data will be passed over. This would occur if the sectors to be generated were to cover a regional area and the data tape contained information for a much larger area.

2. There is less data than required for the specified sectors. This would occur when the data tape contained only regional data, and the sectors desired covered a much larger area. Under these circumstances, warning messages would be generated for those sectors where there were insufficient data and Ø or blank inserted in the areas depending on whether the topic is numeric or alpha respectively.

<u>Reference Field Label</u>

This 12-character field is used to define the data field of the external data file which is to be mapped. It must correspond to the proper field label supplied on the last previous set of E-cards. It must be non-blank, except in the case where a master map is being created from digitized data. If more than one data field from the external data file is to be mapped in one run, the Q-cards must be

interlaced with G-Cards defining the topic name of the map to be generated, and the sectors to be mapped.

Digitized Data Indicator

Placing a mark in this position (Column 16) informs GRID that the attribute to be mapped comes from a GRID-standard digitized data set or F-Cards.

Proximity, Service Radius and Accessibility Maps

Often data is available which is not continuous across an area and can only be represented as discrete points (incidences). With radius and corridor mapping the user can represent these occurrences as either a point or as a circular area. An example of a point might be the occurrences of births, where proximity is not important. On the other hand, an airport should have a service radius associated with it. Another form of proximity could be a service corridor for highways or electrical power lines. With the use of radius and corridor options the user may automatically produce these service areas given the location of the incidence. The field in columns 19 - 30 is used to determine the radius of the service area and should be expressed in miles. A name appearing in this field must have been previously defined on the preceding E-Card sequence and will be used for the local radius value. A floating point number will serve as a global radius value for all the points or areas in the digitized file.

Internal Composition Rule

A decision must be established as to which values appear in the intersections of services radii and corridors; this raises the need

for an internal composition rule. The available rules and some explanation is given in the next paragraph.

'+' Additive rule (real-valued only). Used to create proximity maps. Not legal for corridors. The intersection of several circular regions will have as its value, the sum of the values of the intersecting regions.

'B' Use the minimum value (real,numeric).

'X' Use the maximum value (real, numeric).

'P' Follow the precedence table rules (numeric, alpha).

'ɓ' (Blank) Use the last value in (all map types).

LP Model Number

If data is a SIMPDX or FMPS file, then the user must enter the LP model number. Up to 20 LP models are allowed in GRID.

No Scaling Required

Normally the data values from the external data file are scaled as defined on the J-Cards prior to map generation. In special cases, the data values to be used in creating maps will reside within the range of Ø through 9. Under these circumstances, topic scaling is not required and an "X" is placed in column 39 of the Q-Card to indicate this.

Mask Symbol

A non-blank symbol will cause areas of the generated map to be masked out according to a mask map previously created. The symbol entered is itself the masking symbol--not valid for digitized data sets.

Auto-Scaling and Number of Intervals

Generally, external data will not be in single-character form, suitable for display; more often, it arrives as real or floating

point values which must be scaled.

The user may elect to have the system scale his data as a map is being created, rather than to pre-specify scaling intervals (J-cards). Two options are available--equal interval scaling, and scaling by the technique of nested means. These are selected by placing the appropriate character in column 43.

'E' = Equal intervals

'N' = Nested means

The user than codes the number of intervals in columns 45 through 46 in a way consistent with his option:

'E' - If equal intervals are selected, just code the number of intervals. Up to 32 are allowed.

'N' - The nested means procedure first calculates a mean, and then recursively calculates the mean of all data which is less than, and of all data which is greater than the mean just calculated--up to a depth of five. Thus, 2^6-1 means may be calculated and 2^6 (=32) intervals defined. For nested means, code the maximum depth of recursion (1 through 5).

Reference Accept Label and Value

Occasionally the user may want to map an attribute for a given area conditionally, depending upon the value of some other attribute of the area. (The dictionary cross-reference symbol is often used as the determining attribute.)

In this case, the user would enter the name of the determining attribute (name must appear on E-cards) in columns 48 through 59, and the value to which it is computed in columns 63 through 70 (this value

must be numeric). In column 61 he enters a relation-code for the type of comparison. The codes are:

'E' equal to

'L' less-than

'G' greater-than

'N' not-equal-to

R-CARDS MAP COMPOSITION

R-Expressions

Map composition, i.e., producing a map as a function of several "layers" or maps, is accomplished in this system with the use of R-cards, which allow the user to define a composite map by means of arithmetic, or conditional (IF...THEN...ELSE) expressions (collectively called "R-expressions) involving up to ten maps. The composition may be done in stages if more than ten maps are needed. Changing the "color" of a given map, that is, transforming its symbols into different symbols can also be done. R-cards are essentially free format, although only the first 72 columns are significant and blanks should separate the "words" in the statements.

Since the R-expressions are evaluated for each cell, maps involved in a composition, including the one being defined, must all have the same grid code.

GRID recognizes five types of maps, indicated by the first characters of their names. The resultant types of the values of R-expressions must be consistent with the type of the map being defined, i.e., numeric maps receive "NUMERIC" values, real-valued maps receive "REAL" values, etc.

Examples:

1. Suppose that two real-valued maps, =POP-TRC (population by census tract) and =INC-TRC (aggregate income by census tract) exist; and it is desired to produce a map showing per capita income by tract, =PERCAP. Then the following sequence could be used:

```
G . . . =PERCAP
R    [=INC-TRC] / [=POP-TRC];
```

Note that R-expressions are terminated by semicolons, and that map names are enclosed in square brackets, since names with embedded spaces are allowed (master map aggregates).

2. Invert the coloring of the numeric map, #XYZ:

```
G . . . #XYZ-NEW
R       10 - [#XYZ];
```

3. Produce a numeric map, #ABC, which is colored as follows:

   '9' - privately owned timber land

   '6' - private range*

   '3' - public timber

   '1' - other land

   given the map, #LAND such that

   '6' - denotes timber

   '7' - denotes range

   and the map, #OWNERSHIP such that

   '1' - denotes public

   '2 - denotes private

   Solution:

```
G. . . #ABC
R       IF [#LAND] EQL '6' THEN IF [#OWNERSHIP] EQL '2'
R       THEN '9' ELSE '3'
R       ELSE IF ( [#LAND] EQL '7' AND [#OWNERSHIP] EQL '2')
R       THEN '6' ELSE '1';
```

   Equivalently:

```
G. . . #ABC
R       IF [#OWNERSHIP] EQL '1' THEN
R       IF [#LAND] EQL '6' THEN '3' ELSE '1';
R       IF [#LAND] EQL '6' THEN '9';
R       IF [#LAND] EQL '7' THEN '6' ELSE '1';
```

And more simply:

```
G. . . #ABC
R       IF [#OWNERSHIP] EQL '1' AND [#LAND] EQL '6' THEN '3';
R       IF [#OWNERSHIP] EQL '1' AND [#LAND] NEQ '6' THEN '1';
R       IF [#LAND] EQL '6' THEN '9';
R       IF [#LAND] EQL '7' THEN '6' ELSE '1';
```

When there are several conditionals, a value is returned as soon as one is satisfied.

If the R-expressions are insufficient to cover all the combinations of values actually appearing in the factor maps, a warning will be issued and a unique null value will be returned. A final "ELSE" clause insures that a significant value will always be returned.

Literals in R-Expressions

Numbers are written as you would ordinarily write them. A number is scientific notation; e.g., 1.5×10^{-2} would be written as 1.5E-2. Values for alpha, numeric, and master maps are enclosed in quotes; e.g., 'P', '5', 'XZ4', respectively.

Data Types

Every R-expression has a type. The type of any arithmetic expression is "REAL". The types of all branches of conditional expressions must be the same. Exception: "REAL" and "NUMERIC" values may be used interchangeably.

The only data types which may participate in an arithmetic expression are "NUMERIC" and "REAL". All data types, including "MASTER", participate in relations (EQL, NEG, etc.); however, the values must be comparable.

As was seen in the examples, R-expressions may be constructed using arithmetic operators, conditionals, or both. The basic language elements (operators, connectives, and functions) are shown at the

end of this section.

Keyword, NULL

The keyword, NULL, is a generic name for the background symbols of maps produced by the digitized data routines. NULL is used in the same context as a map name or any other literal, and can replace explicit references to background symbol literals. Currently, the background symbols are:

Map Type	NULL Symbol
(*) Master	')))'
(.) Alpha	')'
(#) Numeric	'0'
(=) Real	-0

Master to Alpha Transfer Function

The function, ALPHA, may be used to create an Alpha-type map from an existing Master map by taking as its symbols, the first character of each corresponding Master map symbol , e.g.

suppose that *X is a Master Map containing the symbols 'ABE', 'DYG', 'UUM', 'ATR', ')))', and that .X is an Alpha map to be created. The following sequence will generate .X:

```
        .
        .
        .
        G. . . . X
        R ALPHA ([*X]);
        .
        .
        .
```

nd it symbols will be 'A', 'D', 'U', '

AVAILABLE OPERATORS, CONNECTIVES AND FUNCTIONS

Data Types: Alpha, Numeric, Real

1. Logical Operators

   NOT

   AND

   OR

2. Regional operators (all data types)

   EQL (equal to)

   NEQ (not equal to)

   GEQ (greater than or equal to)

   GTR (greater than)

   LEQ (less than or equal to)

   LSS (less than)

3. Arithmetic operators (use with numeric and real data types only)

   ** (exponentiation)

   * (multiplication)

   / (division)

   + (plus)

   - (difference, or negative sign)

4. Functions

A = Alpha | N = Numeric | R = Real

Name	Number of Arguments	Description
ABS	1 (R)	Absolute value
MAX	2 (A,N,R)	Maximum
MIN	2 (A,N,R)	Minimum
EXP	1 (R)	Exponentiation, base e
SQRT	1 (R)	logarithm, base e
PRECED	1 (A,N)	precedence function (see 'X'-Card chapter)
ALPHA	1 (M)	Master to Alpha

5. Literal Keywords

NULL   Refers to background symbol of any map generated by digitized data routines

DESCRIPTION OF GRAMMAR

<R-EXPR> = <COND>;|<ARITH>;

<COND> = IF<BOOLEAN>THEN VALUE|IF <BOOLEAN>THEN<VALUE>ELSE<VALUE

<BOOLEAN> = <BOOL-TERM>|<BOOL-TERM> or <BOOLEAN>

<BOOL-TERM> = <BOOL-FACTOR>|<BOOL-FACTOR> and <BOOL-TERM>

<BOOL-FACTOR> =NOT <BOOL-FACTOR>| (<BOOLEAN>)| <RELATION>

<RELATION> = <ARITH> <REL-OP> <ARITH>|<SYMB> <REL-OP> <SYMB

<SYMB> = <E-SYMB>|PRECED (<E-SYMB>)

<E-SYMB> = Literal|Map Name (see text)|NULL

<VALUE> = <COND>| <ARITH>| <E-SYMB>

<ARITH> = <TERM>| <TERM> <PLUSOP> <ARITH>

<TERM> = <FACTOR>| <FACTOR> <MULTOP> <TERM>

<FACTOR> = <PRIMARY>| <PRIMARY> ** <FACTOR>

<PRIMARY> = number (see text)| <E-SYMB>| <FUNCTION>| -<PRIMARY>|
(<ARITH>)

<FUNCTION> = <FNAME> (<ARGLIST>)

<ARGLIST> = <ARITH>| <ARITH>, <ARGLIST>

<FNAME> = function name (see table)

* Note: The letter "O" is not a legal symbol for any kind of map. All legal symbols are listed with the "K" card.

SAMPLE USAGE OF OPERATORS, CONNECTIVES AND FUNCTIONS

<COND>

IF [#LAND] EQL '5' AND ([#SOIL] EQL '1' OR [.TBR]
EQL 'A') OR [#LAND] EQL '0' THEN 'A'
ELSE 'B'

<BOOLEAN>

1. [#LAND] EQL '5' AND ([#SOIL] EQL '1' OR [.TBR] EQL 'A') OR [#LAND] EQL '0'
2. [#LAND] EQL '5' AND ([#SOIL] EQL '1' OR [.TBR] EQL 'A')
3. [#LAND] EQL '0'
4. [#LAND] EQL '5'
5. ([#SOIL] EQL '1' OR [.TBR] EQL 'A')
6. [#SOIL] EQL '1' OR [.TBR] EQL 'A'
7. [#SOIL] EQL '1'
8. [.TBR] EQL 'A'

<BOOL-TERM>

1. [#LAND] EQL '5' AND ([#SOIL] EQL '1' OR [.TBR] EQL 'A')
2. [#LAND] EQL '0'
3. [#LAND] EQL '5'
4. ([#SOIL] EQL '1' OR [.TBR] EQL 'A')
5. [#SOIL] EQL '1'
6. [.TBR] EQL 'A'

<BOOL-FACTOR>

1. [#LAND] EQL '5'
2. ([#SOIL] EQL '1' OR [.TBR] EQL 'A')
3. [#LAND] EQL '0'
4. [#SOIL] EQL '1'
5. [.TBR] EQL 'A'

<RELATION>

1. [#LAND] EQL '5'
2. [#SOIL] EQL '1'
3. [TBR] EQL 'A'
4. [#LAND] EQL '0'

<EXPR>

1. [#LAND]
2. '5'
3. [#SOIL]
4. '1'
5. [TBR]
6. 'A'
7. '0'

Boolean expressions are evaluated as follows:

1. Relational expressions are evaluated for their truth or false value.

2. NOT operations are evaluated for their truth of false value.

3. AND operations are evaluated for their truth or false value from right to left.

4. OR operations are evaluated for their truth or false value from right to left.

Arithmetic expressions are evaluated as follows:

1. Arithmetic primaries are evaluated first.

2. Exponentiation operations are evaluated second.

3. Multiplications and divisions are evaluated third from right to left.

4. Additions and subtractions are evaluated fourth from right to left.

S, T, AND U CARDS STATISTICAL REPORTS

Introduction

Statistical reports can be generated in the same runstream without the need for a separate pass. The values entered into the statistical routines will be the element values from the selected maps.
When using this feature it should be remembered that the data being dealt with have a geographic distribution. Therefore, to perform statistics on absolute figures instead of geographic figures will introduce substantial error. For example, if data are available on county population, these data are best processed in tabular form external to GRID. If, however, the population data are expressed as people per square mile, then these data can be automatically mapped and combined with other topics in obtaining statistical reports.

S-CARD REPORT TITLE

The statistics report title, columns 3 through 72 of the S-cards are alphanumeric free form entries. A maximum of 3 title cards may be used for a given statistical report. The input information should be properly spaced using the center line as a spacing guide. The title is not stored in the system and must be supplied whenever a statistical report is generated.

T-CARD STATISTICS PARAMETERS

One T-card must be supplied when requesting a statistical report. It is possible to generate a statistical report and at the same time generate a map for the sector indicated on the G-card.

Type

Six types of statistical reports are available:

FP = Frequency Polygon

HI = Histogram

MH = Multivariate Histogram

MF = Multivariate Frequency

MR = Multiple Linear Regression

SR = Stepwise Multiple Regression

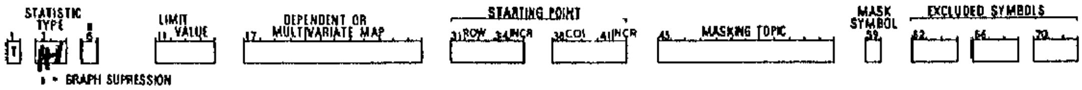
The appropriate two letter combination of the type of report desired must be entered in columns 3 and 4 of the T-card.

A frequency polygon request will plot the frequency of occurrence of each type of element symbol. The abscissa (X-axis) will display the N possible categories, and the ordinate (Y-axis) will plot the cumulative occurrence from Ø to 1ØØ percent.

A histogram request will plot the frequency of occurrence of each type of element symbol. The abscissa will display the n possible categories, and the ordinate will present a bar chart of the frequency of occurrence.

A multivariate histogram or multivariate frequency request will provide a cross-tabulation of two topics displaying the frequency of occurrence of each symbol. It is, therefore, possible to determine how many times a 3 occurred in one map when a 5 occurred in another map.

The above four statistics may be obtained from alpha, numeric or master maps.



Multiple Linear Regression produces a regression analysis of independent maps indicated on U-cards explaining the dependent map on this card.

Stepwise Multiple Regression request will provide a regression of the maps indicated on the following U-cards as independent maps to the map referenced on this card. Maps will be entered in the order of significance unless forced into the model.

No Graph

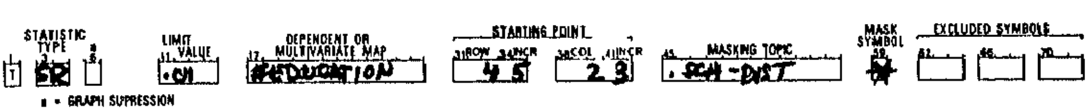
When producing either frequency polygons, histograms, or multiple frequency and histograms, if the maps do not involve a master map then a graph will also be produced showing pictorially the statistical distribution. By checking column 6 with any character this graph will be suppressed from printout. Because of a possibly enormous set of combinations when using master maps, the graphs will be suppressed.

Limit Value for Stepwise Regression

The limit value is used when a stepwise regression is requested and is the significance level for removing a variable from the regression, i.e., a variable whose percentage contribution to the sum of squares is less than this number will not be included in the analysis, unless forced to be. See U-card--Force Option.

Dependent or Multivariate Histogram Map

The dependent map name for use in either multiple linear stepwise multiple regression or the name of th[illegible] cross-tabulations in a multivariate histogram request is entered in columns 17 through 28.



Starting Point

The starting point consists of a row and increment, and a column and increment. This is the point at which selection of elements for any of the statistical reports begin. The row and column entries may vary from 1 to 120 and the increment may vary from 1 to 99. The row and column increment entries control the iteration loop of the starting row and column to determine the elements to be selected. An entry of 10 in both row and column fields and 20 in each of the increments fields would result in elements 10-10, 10-30, 10-50, 10-70, 10-90, 10-110, 30-10, 30-30, etc., being selected for a total of 36 elements per map. This is used in "sampling" map data.

Masking Map

In a number of statistical problems, it is desirable not to allow certain areas to have an influence on the report being generated. This occurs, for example, when working with sectors which border the oceans. Sampling a median income topic map across an entire sector which contained 50 percent water would bias the output report severely. The masking map allows reference to another map which can mask out areas not desired in the analysis. In a sense, it can be considered an override to the starting point iteration.

Masking Symbol

Any valid symbol can be entered in this field. The masking symbol works in conjunction with the masking map and cancels the starting point element iteration whenever the sampled element symbol matches that of the masking symbol entry. If water was represented by the symbol "(" then an entry of this symbol in the masking symbol column 59 would eliminate any reference to this area in the statistical run. If the masking map is a master map then this masking symbol applies to the first of the three master map symbols only.

Excluded Symbols

Within the map being analyzed for statistics there are often areas which are not desirable to be included into the statistical report. Columns 62-64, 66-68 and 70-72 are three fields which can indicate three symbols to be excluded from any report. For non-master map entries only the first column of each field is valid. If this symbol appears on the multivariate map then that cell is disregarded from the statistics report.

The U-card is used only when a multiple or stepwise regression has been requested on a T-card. Up to five U-cards may be used for specifying the independent maps to be used in the regression run.

Independent Map

The independent maps to be used in a multiple regression or stepwise regression are entered on U-cards. Up to five independent maps per U-card may be entered providing a total of 25 possible independent maps to be used for a statistical report request.

Force(F)

An entry in this field forces the use of the respective independent map. A character from 0 to 7 may be used

Blank or 0 = Free   1-9 Order entered

INDEPENDENT VARIABLES OF REGRESSION (F = FORCE OPTION FOR STEPWISE)

1	3 INDEPENDENT MAP	15 F	17 INDEPENDENT MAP	29 F	31 INDEPENDENT MAP	43 F	45 INDEPENDENT MAP	57 F	59 INDEPENDENT MAP	71 F
U	#AGE		#SEX-RATIO							

V-CARD STUDY AREA LEGEND

Whenever a study area is established, there is often the need to supply notes to the generated maps which are pertinent, not just to a single map, but to all maps within the study area. If this need arises, the Study Area Legend cards provide the capability.

<u>Legends</u>

The Study Area Legend, columns 3 through 72 of the V-cards, is an alphanumeric free form entry. Free form means that whatever is placed in this field is used directly on the output maps without modification. A maximum of 3 legend cards may be used for a given run. The input should be properly spaced using the center line as a spacing guide. This legend is not stored in the system and must be supplied whenever it is desired to see it appear on generated maps.

TEXT CENTER TEXT

1 3 36

V SOURCE BUREAU OF THE CENSUS US DEPARTMENT OF COMMERCE

Often a previous G-card will define a multitude of sectors to be processed, but only a few key positions might be needed for display. This is especially true for demand mode processing. The W-card is designed for selectively displaying portions of the area defined on the last G-card. A maximum of one sector can be requested for each W-card. No boundaries may appear on a window display.

<u>Sector Position</u>

Columns 3 through 5 and 6 through 8 indicate the sector row and column which contains the upper left cell of the window of interest. The sector row and column must be one of the sectors referenced by the previous G-card.

<u>Element Position</u>

This field indicates the actual cell row and cell column to be the upper left of the window display. With the two coordinates, sector position and element position, the system is able to uniquely define the starting position of the display.

<u>Dimensions</u>

Columns 17 through 19 should contain an integer indicating the number of rows to print. The maximum value for this field is 12Ø. Columns 20 through 22 contain an integer indicating the columns to print. The maximum value for this field is also 12Ø. Columns 20 through 22 also have a minimum value of 7. The window to be displayed can cross sector boundaries in both directions.

<u>Grey Tone</u>

If a numeric map is to be displayed, and a grey tone is to be shown in place of the numeric characters, an X can be placed in column 24. Exercising this option will yield a display with the same geographic

to its numeric value. The conversion to a grey tone will be in the following manner:

Numeric Map Value		Grey Tone Value
Ø	=	Blank
1	=	.
2	=	-
3	=	+
4	=	=
5	=	0
6	=	0
7	=	Ø
8	=	⊕
9	=	✱

To change this combination of symbols, refer to Y-card.

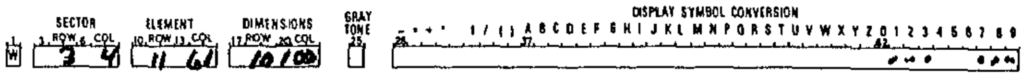
Display Symbol Conversion

The character set of the requested map may be changed before displaying it through use of the display symbol conversion fields. A new symbol or character may be inserted for each symbol which exists on the requested map.

All available symbols are indicated above the symbol conversion field Any changes of characters can be indicated by placing the symbol below the preprinted one. Those fields which do not have an entry will be retained in their original state. If it is desired to have blanks appear, the insertion of a period (.) will suppress a given symbol and cause blanks to appear wherever the symbol is used.

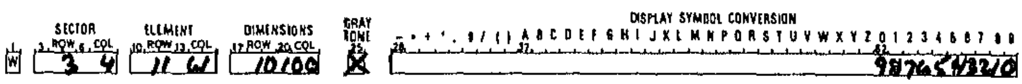
Using this technique, it is possible to generate both upper and lower map thresholds. If, for example, a given numeric map has a range of

Ø - 9, and it is desired to display only the values 3 through 6, with blanks being displayed with the remaining values, the example below depicts how this can be easily accomplished.



This will generate a lower threshold of 3 and an upper threshold of 6. Special displays can be generated using the same capability by setting the numeric values equivalent to alpha values or numeric values. For example, if a road runs through a sector and it is desired for a special report to designate the road in a manner more easily read than the normal numeric distribution map, the values could be adjusted using this feature on the output.

Negative maps or inverted maps can easily be generated by referencing the values of the output map using the following option:



If a map is desired with more contrast but with few categories, a symbol conversion can be used in conjunction with the grey-tone option. An example of this would be a symbol conversion setting 1, 2 and 3 equal to 1; 4, 5, and 6 equal to 5; and 7, 8 and 9 equal to 9.

X-CARD PRECEDENCE TABLE CHANGE

When reducing maps as indicated on the G-card, columns 22 through 24, if a 'P' is entered in column 22 then sector size reduction is performed through the use of the precedence table. This system has a default setting for this table, but often this may not fit the requirements of the user. Through the use of the X-card, a user may change the values of this table. The default values in the table are in descending order as follows:

9 8 7 6 5 4 3 2 1 Ø A B

C D E F G H I J K L M N

P Q R S T U V W X Y Z

- = + * , $ / ( )

There are 44 entries in this table, note that the letter 'O' is not a valid symbol.

Precedence Ordering

From columns 3 through 46 enter the new precedence order in descending order of importance. All 44 symbols should be entered, with none entered more than once.

HIGH PRECEDENCE ORDERING LOW

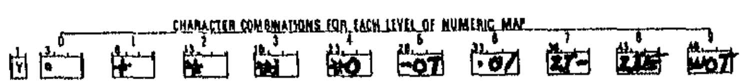
X ABCDEFGHIJKLMNPQRSTUVWXYZ0123456789=+*,$/()-

When W or Z cards are requested, the user has the option to request a grey tone output for numeric maps. Some users find that the combination of 3 characters which this system uses are not satisfactory to their needs. Through the Y-card a user may change the actual symbols used as overprints. This system has some standard combinations which it defaults to, if none are indicated.

These are:

0	prints	blank
1	prints	.
2	prints	-
3	prints	+
4	prints	=
5	prints	0
6	prints	0. overstrike
7	prints	0/ overstrike
8	prints	0+ overstrike
9	prints	0+X overstrike

When changing these values, enter any 3 or less symbols in the indicated columns.



All maps, dictionaries, and glossaries which are to be presented for display must have a Z-card supplied. It is, therefore, possible to generate intermediate maps for statistical purposes without the necessity of displaying them. Before the map is printed, a last opportunity is available to modify it for display purposes. For display without modification the Z-card is supplied behind the appropriate G-card without additional parameters.

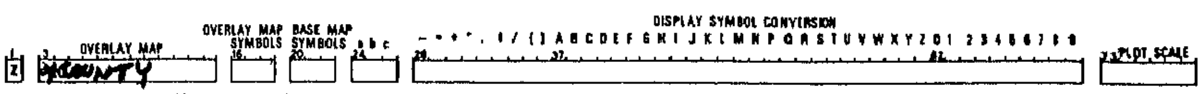
An 'X' in column 2 indicates this is a multiple overlay border card. The symbol conversion codes are not used on a multiple card.

Note: To display a <u>glossary</u> of the map file specified on the A-card, a G-card must be supplied with the keyword of "GLOSSARY" in columns 9 through 16. A glossary depicts the following information about the map file.

RECORD NUMBER	GRID CODE	LINE/ INCH	MAP NAMES	SECTOR ROW COL	CREATION DATE	REFERENCE

<u>Boundary Overlay Map</u>

If it is desired to overlay the map being displayed with boundaries of another map, such as State boundaries on a county map or county boundaries on a Forest map, then an entry must be made in columns 3 through 14 of the Z-card. The name of the overlay map has to be entered here and a boundary symbol must be placed in columns 16 through 18.



<u>Overlay Map Symbols</u>

If the boundary overlay map field is used, up to 3 overprint combination symbols can be entered in columns 16 through 18. These

symbols will be used to define borders between areas of the overlay topic, such as State borders. If these borders are to appear blank, a period (.) must be entered in column 16. If the border is to be plotted on an X-Y plotter, a ($) must be entered in 16.

Base Map Symbols

If symbols are placed in columns 20 through 22, each geographic area of the map specified in the preceding G-card is separated using this overprinted combination between it and adjacent areas. The same rules apply, as above, for blank borders and plots. If a plot is asked for in either column 16 or 20 with a dollar sign ($), no bordering will occur on the printed copy. Columns 73 through 78 contain the scaling factor for the plot.

For example,

1. = Same size as print 2. = Twice as big

.5 = 1/2 as big

The actual size of the map is not changed to facilitate the use of the boundary symbol. To obtain a border, the left-most and top-most characters of each geographic area are set equal to the specified symbols.

Grey Tone

If a numeric map is to be displayed, and a grey tone is to be shown in place of the numeric characters, an X can be placed in column 24.

...n this option will yield a display with the same geographic

...ith symbols whose intensity is approximately proportional to its numeric value. The conversion to a gray tone will be in the following manner:

Numeric Map Value		Grey Tone Value
Ø	=	Blank
1	=	.
2	=	-
3	=	+
4	=	=
5	=	0
6	=	Q
7	=	Ø
8	=	0+
9	=	#Ø

However, the combination of symbols used to produce the grey tone values may be modified if desired by using the Y-card.

Mask Symbol

If a non-blank character is placed in column 25, the system will attempt to match this character with the sixth character of all masking maps in the system (.MASKØ). If the match is successful, then all instances of the coded character appearing in the mask map will be changed to null and the resultant mask will overlay the map being displayed.

Should no matching mask map be found, an error message will be i and display will be inhibited.

Auto Translation

Entries in this column, column 26, apply only to numeric (#) or real valued (=) maps which are to be displayed. The values in a real valued map must always be transformed into single-character symbols before display is possible.

The valid entries and their meanings are:

'T' - (Numeric) Expand present range of values in map to full interval, 0-9.

'S' - (Numeric) Translate present values upward such that max = 9, with no expansion.

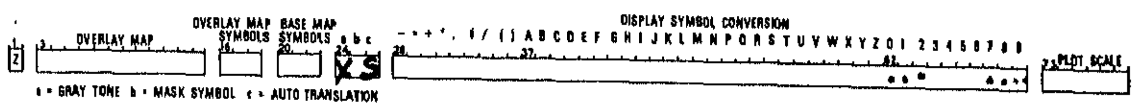
'E' - (Real-valued) Map the real values into the discrete range 0-9 with equal interval scaling.

'N' - (Real-valued) Map the real values into the discrete range 0-9 using the technique of nested means.

Display Symbol Conversion

The character set of the requested map may be changed before displaying it through use of the display symbol conversion fields. A new symbol or character may be inserted for each symbol which exists on the requested map. All available symbols are indicated above the symbol conversion field. Any changes of characters can be indicated by placing the desired symbol below the preprinted one. Those fields which do not have an entry will be retained in their original state. If it is desired to have blanks appear, the insertion of a period (.) will suppress a given symbol and cause blanks to appear wherever the symbol is used.

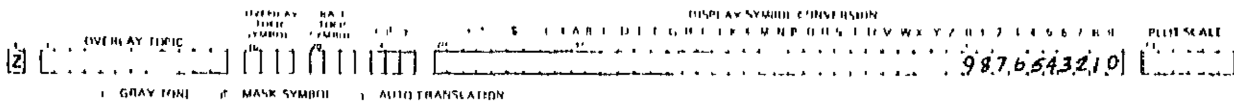
Using this technique, it is possible to generate both upper and lower map thresholds. If, for example, a given numeric map has a range of 0-9, and it is desired to display only the values 3-6 with blanks being displayed with the remaining values, this can be easily accomplished by designating the map values.



This will generate a lower threshold of 3 and an upper threshold of 6. Special displays can be generated using the same capability by setting the numeric values equivalent to alpha values or numeric values. For

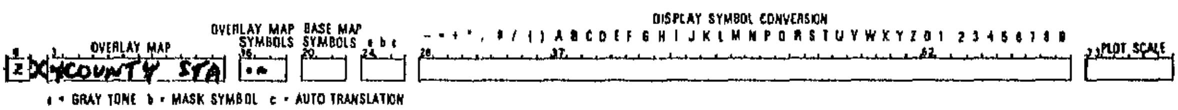
example, if a road runs through a sector and it is desired for a special report to designate the road in a manner more easily read than the normal numeric distribution map, the values could be adjusted using this feature on the output.

Negative maps or inverted maps can easily be generated by referencing the values of the output map using the following option:



Multiple Overlay Boundaries

Multiple Overlay Boundaries may be produced by entering a mark in column 2 of subsequent Z-cards. When this is requested card columns 24 through 80 are not used. The multiple boundary takes precedence over those boundaries mentioned on the previous Z-card. For example, if county boundaries were requested on a Z-card, and immediately following this Z-card request another Z-card were entered with column 2 non-blank and States boundaries requested, the State boundary would be seen when it coincided with county boundaries.



The Dollar card permits the system user to submit certain control statements in field data for interpretation and processing during program execution rather than from the runstream. The allowable control image statements are limited to the 15 which are executable by a call to CSF$. The system calls ER TRAN to pass the image to CSF$. All options and fields must conform to the formats indicated in the Univac Program Reference Manual.

<u>Text</u>

Beginning in column 3 and extending through column 63, the control statement must appear. Column 3 must have an '@' symbol designating this image as an EXEC 8 statement.

Allowable CSF$ images are:

@ADD	@CKPT	@RSPAR
@ASG	@FREE	@RSTRT
@BRKPT	@LOG	@START
@CAT	@MODE	@SYM
@CKPAR	@QUAL	@USE

1	TEXT
$	@USE A.,EXTORL.

APPENDIX B

PROGRAM MESSAGES

Program messages are printed whenever there are problems which have been detected during execution of the Resource Analysis Procedure or when it is desired to bring to the user's attention certain uncommon occurrences which are noteworthy. Generally, the messages are self evident; however, further explanation may prove helpful at times. This chapter presents all the RAP system Error and Warning Messages and Run Stop notifications with further explanations.

ERRORS AND WARNINGS - EDIT PHASE

ERROR 1 INVALID FIRST CHARACTER IN ABOVE CARD, CARD IGNORED

Column 1 has a character which cannot be recognized as a valid RAP card type.

ERROR 2 G-CARD MISSING, ABOVF CARD IGNORED

An action on a map was requested, but was not preceded by a G-card, or the preceding G-card was in error.

ERROR 3 '************' ALREADY GENERATED, ABOVE CAR IGNORED

A topic generation following a G-card can only be specified by one type of card from the set: K, N-U; or a G-card is missing.

ERROR 4 COLUMN 58 DIFFERS FROM PREVIOUS A-CARDS, CARD IGNORED

An input map file was assigned on tape 7 and column 58 of

the A-card was marked, or no input map file was assigned on tape 7, but column 58 of the A-card was not marked.

ERROR 5 MAP FILE '************' PROCESSED, FILE NAME INCORRECT

The map file name of the input file or, in case of "no input tape," of the first request differs from the map file name indicated in columns 61 through 72 of the A-card.

ERROR 6 TRANSACTION '******' INVALID, CARD IGNORED

The transaction code on the A-card was misspelled.

ERROR 7 GRID CODE MISSING, CARD IGNORED

The B-card or G-card does not indicate any grid code in columns 3 through 7.

ERROR 8 INCORRECT OR MISSING DICTIONARY NAME

The dictionary name on the B-card was either not filled in or does not start with a dollar sign in column 9.

ERROR 9 'DELETE' HAS BEEN SPECIFIED, ABOVE CARD IGNORED

Under a "delete" transaction, no C-cards need be supplied, as the entire dictionary will be destroyed.

ERROR 10 NONNUMERIC CODE FOUND FOR SEARCH FACTOR, CARD IGNORED

The B-card shows a nonnumeric character in column 26 for the search factor. Enter a number between 1 and 9.

ERROR 11 AREA CODE MISSING, CARD IGNORED

The area code in column 3 through 14 of the C-card is missing.

ERROR 12 AREA SYMBOL MISSING, CARD IGNORED

The area symbol in columns 16 through 18 of the C-card is missing.

ERROR 13 SECTOR ROW INCORRECT, CARD IGNORED

The sector row designation in columns 20 to 22 of the C-card is less than 1 or is nonnumeric. Enter a number between 1 and 999.

ERROR 14 SECTOR COLUMN INCORRECT, CARD IGNORED

The sector column designation in columns 23 to 25 of the C-card is less than 1 or is nonnumeric. Enter a number between 1 and 999.

ERROR 15 ELEMENT ROW INCORRECT, CARD IGNORED

The element row designation in columns 27 to 29 of the C-card is less than 1 or greater than 120. Enter a number between 1 and 120.

ERROR 16 ELEMENT COLUMN INCORRECT, CARD IGNORED

The element column designation in column 30 to 32 of the C-card is less than 1 or greater than 120. Enter a number between 1 and 120.

ERROR 17 SYMBOL '***' ALREADY DEFINED FOR THIS CODE, CARD IGNORED

The area code on this C-card has been used with another symbol than the one used in columns 16 to 18. Use equal symbols for equal area codes.

ERROR 18 CODE LESS THAN LAST CODE, INPUT OUT OF SEQUENCE

The C-cards have to be submitted in ascending order by area code. Offending card is ignored.

ERROR 19 THE SAME SYMBOL HAS BEEN USED FOR CODE '************'

The area symbol in columns 16 to 18 has been used before with another area code. Use different area symbols with different area codes. Offending card is ignored.

WARNING 20 CODE USED TWICE UNDER TRANSACTION 'REMOVE', CARD IGNORED

Under a transaction code of "remove" only one C-card per area code needs to be supplied.

WARNING 21 MORE THAN 4800 CODES AND SYMBOLS COMPARISON STOP

A maximum of 4800 codes per dictionary is allowed. Study area should be reorganized into smaller sectors.

ERROR 23 INDICATED FILE FORMAT IS IN ERROR

File type index must be a number between 1 and 11. See D-card definition for correct code.

ERROR 24 EXTERNAL FILE NAME MISSING OR INCORRECT

The external file name must appear in columns 3 thru 14.

ERROR 25 DICTIONARY NAME MISSING OR INCORRECT

The dictionary name in columns 21 through 32 of the D-card has either been left out or does not start with a dollar sign in column 21.

ERROR 26 CLIPPING COORDINATES ARE MISSING OR INCORRECT

Coordinates contain nonnumeric characters, or are inconsistent, or are out of range for the system indicated in column 34.

ERROR 27 CLIPPING COORDINATE SYSTEM UNDEFINED

Only 'S', 'G', or 'U' may be entered in column 34.

ERROR 28 D-CARD MISSING OR INCORRECT, ALL E-CARDS IGNORED

Either no D-card has been found preceding the E-cards or the D-card found was incorrect.

ERROR 29 NEXT CARD IS NOT AN (E -CARD, T -CARD), ABOVE (D-CARD, S-CARD) IGNORED

All (E-cards, T-cards) have to follow immediately the (D-card, S-card).

ERROR 30 ONLY ONE SET OF E-CARDS FOR EACH D-CARD

E-cards must immediately follow a D-card.

ERROR 31 FORMAT MISSING OR INCORRECT

The format description fields on E-cards have to be filled in for a "FORTRAN" formatted file. These fields were either not filled out or incorrectly filled out.

ERROR 32 ALPHA FORMAT FOUND FOR FIELD LABEL '************',
BUT LABEL DOES NOT EQUAL 'SYMBOL' OR
'CODEØ1' OR 'CODEØ2'

Alphanumeric format descriptors on the F-cards are only allowed for a cross-reference field label in case of a cross-reference by symbol or code.

ERROR 33 MORE THAN 132 CHARACTERS DEFINED FOR EXTERNAL
RECORDS

The combined fields defined on E-cards for a "FORTRAN" formatted external data file specify more than 132 characters. 132 is the limit for Fieldata external data files.

ERROR 34 MORE THAN 3 'V' CARDS, ABOVE CARD IGNORED

A legend on V-cards is restricted to 3 cards per run.

ERROR 35 'V' CARDS FOUND BEFORE, ABOVE CARD IGNORED

All V-cards have to be supplied together.

ERROR 36 B-CARD MISSING, ABOVE CARD IGNORED

A C-card has been found, but was not preceded by a B-card.

ERROR 37 DICTIONARY NAME INVALID ON G-CARDS

For transactions concerning dictionaries use B-cards and not G-cards.

ERROR 38 COLUMN 9 MUST BE EITHER '*/-/:/./#/=' TO BE
ACCEPTED

Column 9 indicates the data-type for the referenced map and must be one of the above symbols.

ERROR 39 SECTOR DESIGNATION IN COLUMNS ** THROUGH **
INCORRECT

ERROR 40 CROSS-REFERENCE FIELD LABEL KEYWORDS NOT
FOUND

One of the following sets of keywords must be found:

SYMBOL

CODEØ1, CODEØ2

LATITUDE, LONGITUDE

UTME, UTMN, UTMZONE

ERROR 41 NONNUMERIC CHARACTER IN SECTOR DEFINITION

A nonnumeric character has been found in a sector row and column designation on the G-card. Enter numbers only.

ERROR 42 TEXT OVERLAY HAS ALREADY BEEN DEFINED FOR THIS SECTOR, ABOVE CARD IGNORED

All text overlay H-cards for one specific sector have to be supplied together.

ERROR 43 ROW OR COLUMN DESIGNATION MISSING IN COLUMNS ** THROUGH **

The row or column designation on the H-card has to contain 2 numeric entries of numbers between 1 and 120.

ERROR 44 NUMBER OF CHARACTERS IN COLUMN ** INCORRECT

The number of characters for a text overlay on the H-card has to be a number between 1 and 12.

ERROR 45 NONNUMERIC CHARACTER IN ROW, COLUMN OR NUMBER OF CHARACTERS FIELD

A nonnumeric character has been found in a numeric field on the H-card. Row and column pointers and the number of characters can only be numeric entries.

WARNING 46 MORE THAN 30 I-CARDS, ABOVE CARD IGNORED

A maximum of 30 I-cards, title cards, is allowed per topic.

ERROR 47 MORE THAN 35 J-CARDS, SCALE IGNORED

ERROR 48 NONNUMERIC CHARACTER IN FIELD, COLUMN **

A threshold field on a J-card contains a nonnumeric character. Enter only integer or decimal numbers in the threshold fields.

ERROR 49 LOW END OF SCALE ALREADY DEFINED FOR SYMBOL
'<'

For only one symbol is a blank lower threshold field accepted on the J-card scale.

ERROR 50 HIGH END OF SCALE ALREADY DEFINED FOR SYMBOL '<'

For only one symbol is a blank upper threshold field accepted on the J-card scale.

ERROR 51 EXT-FILE '************' EXPECTED BUT '************' FOUND

External file name from columns 3-14 was not found on the external data file, the indicated text was found instead.

ERROR 52 TOPIC NAME ON PREVIOUS G-CARD MISSING OR INCORRECT, ABOVE CARD IGNORED

The topic name in columns 9 through 20 of the previous G-card is missing or not left adjusted.

ERROR 53 SECTOR DEFINITION MISSING ON PREVIOUS G-CARD, ABOVE CARD IGNORED

No sector designation has been found on the previous G-card.

ERROR 54 REFERENCE TOPIC NAME MISSING OR INCORRECT

The reference topic name in columns 3 through 14 of the K-card is either missing or not left adjusted.

ERROR 55 INSUFFICIENT SPACE FOR I-T-E PROGRAM

User's source code for map composition is too large. Compose maps in stages.

ERROR 56 ONLY DICTIONARY NAMES ALLOWED AS REFERENCE TOPIC

The reference dictionary in colu
N-card is either missing or doe
sign in column 3.

ERROR 57 VALUE MISSING FOR SYMBOL ' * '

A 3-character symbol has been found on the N-card with no associated value to replace the symbol.

ERROR 58 NONNUMERIC VALUE '*' DEFINED FOR NEW NUMERIC TOPIC

The topic name on the previous G-card defines a new numeric topic. All values replacing the dictionary symbols have to be numbers between 0 and 9.

ERROR 59 SYMBOL MISSING FOR VALUE '*'

A value has been found on an N-card with no associated dictionary symbol, which the value will replace.

ERROR 60 SECOND REFERENCE TOPIC NOT ALLOWED FOR THIS TRANSACTION

Following a G-card two N-cards with a reference dictionary in columns 3 through 14 have been found. Use only one reference dictionary.

ERROR 61 LEFT (RIGHT) SIDE LINE MISSING AFTER LINE * * *

The element matrix P-cards do not account for 120 left and 120 right-hand lines.

ERROR 62 TOO MANY MATRIX CARDS

All lines of an element matrix have been accounted for, but still more P-cards, left or right-hand cards have been found.

ERROR 63 ROW *** EXPECTED, BUT ROW *** FOUND

The row designation in columns 3 through 5 of a left-hand P-card or columns 63 to 65 of a right-hand card is not correct.

ERROR 64 DOT INVALID AS FIRST CHARACTER ON LINE

The first matrix element on a left or right-hand matrix card cannot be a dot. Enter the correct character.

ERROR 65 DOT MISSING COLUMN, **

A symbol repetition has not been designated on a matrix card.

ERROR 66 NONNUMERIC CHARACTER '*' FOUND IN COLUMN **, INVALID TO GENERATE A NUMERIC TOPIC MAP

The previous G-card defined a numeric topic name in columns 9 through 20. Only numbers between 0 and 9 are allowed as elements on an element matrix.

ERROR 67 'ROW TO' *** INCORRECT

The "row to" designation in columns 6 through 8 of the left-hand P-card or columns 66 to 68 of the right-hand matrix card is either greater than 120 or less than the "row from" entry in the preceding 3 columns.

ERROR 68 NONNUMERIC CHARACTER IN ROW DESIGNATION

The row designations have to be numbers between 1 and 120.

ERROR 69 INCORRECT LINEAR PROGRAMMING FUNCTION CODE

Only the key words 'SIMPDX' or 'FMPS' are allowed in columns 3 - 8.

ERROR 70 MASTER MAP NAME MISSING OR INCORRECT

Columns 27 thru 38 must contain the master map used as the area cross-reference. Column 27 must be '*'.

ERROR 71 NONNUMERIC VALUE IN NUMERIC FIELDS OF L-CARDS

Columns 14 thru 19 contain a nonnumeric character, this should be numeric only.

ERROR 72 LP-MATRIX TOO LARGE FOR RAP, ENTER FMPS FUNCTION CODE

The LP matrix i

Reenter as FMP

ERROR 73 ONLY 20 DIFFE

RESUBMI'

RAP can keep track of only 20 LP modes per run. Resubmit jobs in groups of 20 or less LP modes per run.

ERROR 74 NONNUMERIC ENTRY IN ROW OR COLUMN FIELDS

Columns 3 - 5 and 16 - 18 contain nonnumeric characters, these columns must have numbers 0 - 9 only.

ERROR 75 .TYPE OF MATRIX VALUE EITHER MISSING OR INCORRECT

Column 32, indicating type of matrix value must contain either 'L' for literal, 'V' for value or 'A' for area.

ERROR 76 D AND E-CARDS MISSING OR INCORRECT

A Q-card has been found, but either no D and E-cards, or the D and E-cards found contained errors.

ERROR 77 REFERENCE FIELD LABEL MISSING

The reference field label in columns 3 through 14 of the Q-card has been left blank.

ERROR 78 LABEL '************' NOT FOUND ON E-CARDS

The reference field label in columns 3 through 14 of the Q-card has not been defined on the set of E-cards. Enter this name in the appropriate sequence on the E-card set.

ERROR 79 NONNUMERIC CHARACTER IN FORMULA NUMBER, COLUMN **

A formula number has been entered in column 32 or 34, but entries can be only numbers 1 to 9 in column 32 or 1 or 2 in column 34.

ERROR 80 POINT FORMULA NUMBER MISSING, BARRIER ONLY USED IN CONJUNCTION WITH POINTS

A barrier topic name has been entered in columns 19 through 30 of the Q-card, but no entry has been made in the point formula field in column 34. Enter a 1 or 2 in column 34.

ERROR 81 NUMBER OF INTERVALS SPECIFIED FOR AUTO-SCALE IS INVALID

A maximum of 32 intervals is allowed. If column 43 equals 'E', a number between 1 and 32 must be entered. If column 43 equals 'N', a number between 1 and 5 (power of 2) must be entered.

ERROR 82 NONNUMERIC CHARACTER IN ACCEPTANCE VALUE, COLUMNS 63 - 70

ERROR 83 EXTERNAL FILE NOT ASSIGNED OR MOUNTED

Rerun and assign the unit indicated in column 19 (via @ASG or @USE).

ERROR 84 GREATER THAN 16 SECTORS SPECIFIED ON G-CARD

Subdivide the current map into subareas with no more than 16 sectors per area. (External data must be reread for each subarea)

ERROR 85 UNIT ENTRY MUST BE NUMERIC FOR THIS FILE TYPE

For FORTRAN formatted or FMPS files the unit appearing in column 19 must be one of the numbers 1 - 4, or 8.

ERROR 86 BOUNDARY OVERLAY TOPIC HAS INVALID ENTRY

'************'

The boundary overlay topic field in columns 3 through 14 of the Z-card must be of type master, alpha, numeric or boundary.

WARNING 87 BOUNDARY OVERLAY SYMBOL NOT SPECIFIED. BLANK ASSUMED.

No entry has been made in column 16 or column 20 of the Z-card.

ERROR 88 PRINTOUT OF GLOSSARY NOT POSSIBLE, NO INPUT MAP FILE ASSIGNED

A glossary printout request has been made with a G-card, but no input map file has been assigned.

ERROR 89 ************ IS AN ILLEGAL MAP NAME IN

A dictionary or a title/scale has been used in an R-expression.

ERROR 90 SYMBOL '*' IN CARD COLUMN ** INVALID, NOT ALLOWED FOR SYMBOL CONVERSION

A symbol on the K-card has been found which is not in the set of characters preprinted above the card. Use only entries which are preprinted above the K-card.

ERROR 91 ALPHA SYMBOL '*' IN COLUMN ** NOT ALLOWED AS CONVERSION SYMBOL FOR A NUMERIC TOPIC

A numeric new topic name has been specified on the preceding G-card. Enter only numbers between 0 and 9 as replacing symbols on the K-card.

WARNING 92 SYMBOL '*' IN COLUMN ** REPLACES ALPHA SYMBOL '*', WHICH DOES NOT EXIST ON THE NUMERIC REFERENCE MAP

A numeric topic name has been defined in columns 3 through 14 of the K-card, which does not contain alpha symbols. All entries in columns 17 through 50 are unnecessary.

WARNING 93 ASTERISK-CARD MISSING IN FRONT OF REQUEST DECK

Precede the RAP request deck with a card with an asterisk in column 1.

WARNING 94 ASTERISK CARD MISSING BEHING REQUEST DECK

Follow the RAP request deck with a card with an asterisk in column 1.

ERROR 95 K-CARD REFERENCE AND G-CARD TOPIC NAME CANNOT BE EQUAL

The topic name on the G-card has to differ from the reference topic name used on the K-card. Only in case of a 'modify' transaction can the names be equal.

ERROR 96 '...' IS AN ILLEGAL LITERAL

Only "numeric", "alpha" or "master" type literals are admissible. The string within quotes in the R-expression is longer than 3 characters.

ERROR 97 MORE THAN 120 ENTRIES SPECIFIED FOR MODIFY OR REMOVE, ABOVE CARD IGNORED

The "change" table for dictionary processing has been exceeded. Reduce the size of the run and resubmit it.

WARNING 98 NO MORE THAN 3 S-CARDS ALLOWED

More than 3 report title cards were specified. All entries after 3 are ignored.

ERROR 99 STATISTICS TYPE MISSING OR INCORRECT, ABOVE CARD IGNORED

Type of statistical run specified in T card does not match the acceptable types.

ERROR 100 LIMIT IGNORED FOR TYPE **

A limit value was specified for a statistical run which does not use a limit value.

ERROR 101 STARTING POINT OR INCREMENT MISSING, ABOVE CARD IGNORED

A required starting point or increment is missing for the statistical run type specified.

ERROR 102 STARTING ROW GREATER THAN *** OR STARTING COLUMN GREATER THAN 120

A starting row or column out of range has been specified.

ERROR 103 NONNUMERIC LIMIT OR STARTING POINT, ABOVE CARD IGNORED

A nonnumeric character has been used as a parameter in the limit or starting point parameter.

WARNING 104 STARTING POINT AND INCREMENT IGNORED FOR TYPE **

A starting point and increment was specified for a statistical run type which does not use those values.

ERROR 105 INCORRECT MASKING TOPIC ************ ABOVE CARD IGNORED

A masking topic was specified which could not be located or is incorrectly specified.

ERROR 106 MASKING SYMBOL * INCORRECT, ABOVE CARD IGNORED

A masking symbol was specified which is not a suitable suffix.

WARNING 107 DEPENDENT TOPIC IGNORED FOR TYPE **

A dependent topic was specified for a statistical run type which does not use these values.

ERROR 108 DEPENDENT TOPIC ************ INCORRECT, ABOVE CARD IGNORED

A dependent topic was specified which could not be located.

ERROR 109 DEPENDENT TOPIC MISSING, ABOVE CARD IGNORED

A dependent topic was not specified for a statistical run type which requires this entry.

ERROR 110 U-CARDS NOT EXPECTED, ABOVE CARD IGNORED

U-cards are not required for this statistical run type and therefore should be omitted.

ERROR 111 T-CARD MISSING, ABOVE CARD IGNORED

Either cards are out of sequence or the T-card was not provided. The T-card must immediately precede the U-cards.

ERROR 112 INDEPENDENT TOPIC MISSING FOR F

An independent topic was not specified in the U-card where expected for type of run specified.

ERROR 113 INDEPENDENT TOPIC ************ EQUAL TO DEPENDENT TOPIC

An independent topic was specified which has the same name as a specified dependent topic.

ERROR 114 INDEPENDENT TOPIC ************ INCORRECT

An independent topic was specified that cannot be located.

ERROR 115 MERGER FILE '************' INCORRECT

Name in column 44-55 does not match with header found on "MERGER" file.

ERROR 116 MERGER INPUT FILE ERROR, UNIT *, STATUS ***

ERROR 117 SUBSET FILE NAME IS INCORRECT

Subset file name must have a non-blank entry with action of "SUBSET".

ERROR 118 SUBSET OUTPUT FILE ERROR, UNIT *, STATUS ***

ERROR 119 NUMBER OF MAPS REFERENCED MUST NOT EXCEED 10

There are more than 10 map names referenced in R-expressions. Compose the maps in stages.

ERROR 120 INSUFFICIENT SPACE FOR PARSER OUTPUT

During the parse of a set of R-expressions, output buffer overflowed. Compose the maps in stages.

ERROR 121 PARSER STACK OVERFLOW

R-expressions are too heavily nested. Simplify.

ERROR 122 NO MAPS REFERENCED IN R-EXPRESSIONS

SYNTAX ERROR 123 STMT ***; OCCURS BEFORE LINE ***, COLUMN ***

Error in R-expression grammar. Refer to R-card section and grammar description.

ERROR 124 LITERAL TABLE OVERFLOW

Caused either by deeply nested expressions, or simply too many literal values. Simplify.

ERROR 125 TITLE/SCALE NOT POSSIBLE, NO INPUT MAP FILE

Title/scale request is performed on existing title/scale blocks and none were found.

ERROR 126 MORE THAN ONE SECTOR DEFINED ON G-CARD

Topic generation can only reference one sector when creating topic map.

ERROR 127 NONNUMERIC TOPIC '************' USED AS BARRIER TOPIC

Barrier topic should be a numeric map, columns 3 through 14.

ERROR 128 ILLEGAL VALUE IN COLUMN, **

A value was specified in the column noted which is incorrect.

ERROR 129 COLUMNS 02 22 MUST BE BLANK ON O-CARDS (OTHER THAN FIRST)

Only the first O-card may contain the control characters for topic generation by points or lines.

ERROR 130 ERROR IN CONVERTING O-CARD DATA, POSSIBLY NON-NUMERIC CHARACTER IN NUMERIC FIELD

Check all entries in point and line values for blanks or other nonnumeric characters.

ERROR 131 POINT VALUES OUTSIDE THE RANGE (-0.5,9.5) REQUIRE SCALING

When scaling has not been provided via J-cards, all data values must be greater than or equal to -0.5 and less than 9.5.

ERROR 132 DISPERSION MUST BE SPECIFIED FOR EACH POINT/LINE WHEN GLOBAL DISPERSION (COLUMN 17) IS BLANK

Dispersion must be specified either for each individual point, or for the entire set of values with an entry in column 17 of the O-card.

ERROR 133 COLUMNS ** THROUGH ** SHOULD BE SPECIFIED FOR GENERATION BY LINES, STARTING VALUES ASSUMED

When generating maps by lines, both a starting point and an ending point are to be specified. Check values and resubmit.

ERROR 134 INCORRECT POINT/LINE DEFINITION IN COLUMNS ** THROUGH **

The values specified in the stated columns are not consistent for map generation. Check the values within the stated columns and resubmit.

ERROR 135 MERGER, SUBSET AND STATISTICS UNITS MUST BE UNIQUE

Columns 38, 40 and 42 must not have the same values.

ERROR 136 MERGER, SUBSET AND STATISTICS MUST BE UNITS A THRU Z

Columns 38, 40 and 42 must have unit assignments of A thru Z.

ERROR 137 ONLY A ' ' CARD OR EXIT ARE ALLOWABLE

In demand mode, only. For cards which can appear in multiples, 'EXIT' must be entered to terminate the card series.

ERROR 138 AREA POINTER TYPE HAS NOT BEEN INDICATED

One of columns 31, 33 or 35 must be non-blank indicating type of area pointer to appear on subsequent C-cards.

ERROR 139 ONLY ONE AREA POINTER MAY BE MARKED

One of columns 31, 33 or 35 must be non-blank indicating type of area pointer to appear on subsequent C-cards.

ERROR 140 ONLY MAPS CAN BE DISPLAYED WITH A W-CARD

A non map name was entered on previous G-card.

ERROR 141 DATA TYPES: ****** AND/OR ****** ILLEGAL FOR ****** MAP

The map being created must receive values of a type consistent with its own; for example, alpha maps must receive alpha values.

ERROR 143 F-CARD DOES NOT CONFORM TO FORMAT OR DOES NOT CONFORM TO E-CARDS

ERROR 144 MORE F-CARDS EXPECTED

Premature end to F-card series. Number of data items as specified on E-cards not yet encountered or a closed polygon (feature type 1) was indicated but coordinates are missing.

ERROR 145 SEGMENTS MISSING IN POLYGON

First point does not equal last point to close polygon.

ERROR 146 ROW VALUE IS GREATER THAN NUMBER OF CONSTRAINTS

Row value indicated in columns 3 - 5 of M-card must not exceed number of constraints indicated in columns 14-16 of L-card.

ERROR 147 COLUMN VALUE IS GREATER THAN NUMBER OF VARIABLES

Row value indicated in columns 16 - 18 of M-card must not exceed number of constraints indicated in columns 17 - 19 of L-card.

ERROR 148 BOTH ROW AND COLUMNS CANNOT BE ZERO

Row zero column zero is undefined.

ERROR 149 BOTH ROW AND COLUMN NAMES CANNOT BE BLANK

ERROR 150 RHS RELATIONSHIP HAS INVALID ENTRY

With column equal to zero or blank, RHS entry must be one of the following:

'EQ' for equal

'GE' for greater than or equal

'LE' for less than or equal

ERROR 151 NONNUMERIC VALUE IN LITERAL FIELD, COLUMNS 34 - 45

Literal indicated in column 32 but nonnumeric found.

ERROR 152 MAP-NAME MISSING OR INCORRECT

Column 32 indicates 'A' area or 'V' value, and columns 34 - 45 must contain a valid map name.

ERROR 153 MISSING OR INVALID POINTER-TYPE CODE

Column 47 must contain either 'S' for sector pointer or 'G' for geographic pointer or 'U' for UTM pointer or 'A' for area codes.

ERROR 154 NONNUMERIC VALUE IN POINTER FIELD

ERROR 155 AN L-CARD MUST PRECEDE A GROUP OF M-CARDS

LP model must be defined with L-cards before matrix generation by M-cards.

ERROR 156 AREA SYMBOLS NOT VALID FOR VALUE OF MAP POINTER

When 'V' is used in column 32 indicating map value, only 'S', 'U' or 'G' may be entered in column 47.

ERROR 157 ROW AND COLUMN POINTERS MUST BE BETWEEN 1 AND 12Ø

Each sector is only 120-by-120 and pointer must be within this sector.

ERROR 158 MASTER MAPS MUST HAVE 3-CHARACTER SYMBOL

When columns 34 thru 45 contain a master map and column 47 equals 'A' then the symbols entered in columns 56 - 58 and/or 61 - 63 and/or 66-68 and/or 71 - 73 must be either 3-character or blank.

ERROR 159 NUMERIC MAPS MUST HAVE ONLY A SINGLE CHARACTER

See explanation on ERROR 158.

ERROR 160 THERE IS A CONFLICT ON THE NAME/SYMBOL FOR THIS ROW

This row was previously given another name or symbol.

ERROR 161 THERE IS A CONFLICT IN THE NAME/SYMBOL FOR THIS COLUMN

This column was previously given another name or symbol.

ERROR 162 POINTER FALLS OUTSIDE CLIPPING VALUES FROM L-CARD

Enlarge clipping window on L-card or correct pointer value.

WARNING 163 NOT ABLE TO DETERMINE UNIQUENESS OF ROW AND COLUMN NAMES ON LP MODIFICATION

On restart option some error checking is inhibited.

ERROR 164 FOR A LP MODEL MODIFICATION, ONLY FUNCTION AND MODEL NUMBER ARE NECESSARY

The values from the restarted LP model are used in this new model.

ERROR 165 THIS LP MODEL CANNOT BE FOUND FOR MODIFICATION

Check columns 10 and 11 for correct restart model number.

ERROR 166 THE LP MODEL MUST HAVE M-CARDS FOR INITIAL MODEL

The first LP model must have matrix entries enter via the M-cards.

ERROR 167 FMPS DATA FILE MUST BE CROSS-REFERENCED BY SYMBOL

Master map symbols are used as the cross-reference between FMPS data and the RAP system.

ERROR 168 LP MODEL NUMBER IS GREATER THAN THE LP's DEFINED

ERROR 169 THE CHARACTER '*' IS ILLEGAL

Illegal area code symbol entered in columns 56 - 58 or 61 - 63 or 66 - 68 or 71 - 73 when an 'A' was entered in column 47.

ERROR 170 THIS ROW NAME HAS BEEN GIVEN TO A COLUMN PREVIOUSLY

Row names must be unique from all column names.

ERROR 171 THIS COLUMN NAME HAS BEEN GIVEN TO A ROW PREVIOUSLY

Column names must be unique from all row names.

ERROR 172 NUMERIC MAP MAY HAVE ONLY 10 OR FEWER VALUES

ERROR 173 F-CARDS ILLEGAL; D AND E-CARDS ARE MISSING

ERROR 174 SECTOR ROW *** COLUMN *** MULTIPLY DEFINED

ERROR 175 NEXT CARD IS NOT A 'U' CARD, ABOVE T-CARD IGNORED

Regression asked for on T-card but no independent maps indicated, because no U-cards found.

ERROR 176 ONLY 'B' OR 'C' CARD ALLOWED WITH A 'REMOVE' ACTION

ERROR 177 ONLY 'B' OR 'G' CARDS ALLOWED WITH A 'DELETE' OR 'MERGER' OR 'SUBSET' ACTION

ERROR 178 CODE GENERATES MORE THAN 2400 INSTRUCTIONS, SIMPLIFY

ERROR 179 THIS IMAGE MUST HAVE A '@' IN COLUMN 3

All calls to CSF$ must be EXEC-8 control images which start with a '@'.

ERROR 180 CONTROL STATEMENT IS NOT LEGAL FOR CSF$, REFER TO PRM

Only a limited set of control statements may be entered dynamically. Please refer to PRM for legal statements.

ERROR 181 SUBSET OR MERGER FILE NOT ASSIGNED, EXECUTE '$' CARD

ERROR 182 CROSS-REFERENCE KEY WORDS ARE MULTIPLY DEFINED

Only one set of the cross reference key words may be entered on E-cards.

ERROR 183 REDUCTION RULE MUST BE 'A', 'M', 'P' or 'b̸'

See G-card section for explanation of codes.

ERROR 184 'AVERAGE' RULE IS INVALID FOR TOPIC SPECIFIED

Since arithmetic operations are involved in employing the reduction rule, topic must be either type numeric or real.

ERROR 185 E-CARDS ARE MISSING OR INCORRECT

Data must be entered before map topics can be created via Q-cards.

ERROR 186 RADIUS SPECIFICATION WRONG

The radius value is extremely large, it is greater than a sector in size. Either make the radius smaller or increase the scale of the map.

ERROR 187 UNKNOWN COMPOSITION RULE. USE B

The internal composition rule for interse corridor is incorrectly stated valid code interpretation

ERROR 188 INTERNAL COMPOSITION RULE ILLEGAL FOR THIS MAP

Composition rules often are valid for only a particular kind of map. The Q-card documentation indicates which rules apply to which map types.

ERROR 189 ADDITIVE COMPOSITION ILLEGAL WITH 'E' OR 'N' SCALING

The automatic scaling options of 'E' or 'N' act on the actual external values and do not include the values which are intersections of areas; therefore, this combination has been indicated as illegal. To do an equal-interval or nested-means display of such a map,

first create a real-valued map with 'E or 'N' in column 43 of the Q-card. Then display the map with a Z-card indicating automatic nesting or equal-intervaling.

WARNING 190 REAL VALUED MAPS MUST BE SCALED FOR DISPLAY

The previous G-card indicates that this is a real valued map but column 26 contains neither an 'E' nor a 'N'. Also, up to this time, a set of J-cards for scaling has not been entered. If there already exists a title/scale block on the map file then the real valued map will be scaled for output by that scale, if not then an error will occur at map display time in phase II.

ERROR 191 J-CARDS NOT VALID FOR TOPIC DEFINED ON G-CARD

Scale entries apply to numeric or alpha or real-valued map types only.

ERROR 192 SCALING OPTIONS INCONSISTENT WITH TYPE OF MAP

Nested-means and equal-internal scaling are only valid for real-valued maps. Range expansion and translation are valid only for numeric maps.

ERROR 193 ELEMENT DESIGNATION IN COLUMNS XX THROUGH XX INCORRECT

The row and column positions for the element displacement must must be between 1 and 120 for an 8 or 10 line-per-inch map in both row and column. For a 6 line-per-inch map, row designation can be between 1 and 90 while column is still 1 through 120.

ERROR 200 MORE THAN 1210 BORDER POINTS - PROGRAM STOPPED IN SUBROUTINE POINT

Simplify the master map into smaller regions by disaggregation of complex areas.

ERROR 201 DICTIONARY ************ NOT FOUND, NO UPDATE MADE

Dictionary transactions of modify or remove have been specified, but the dictionary has not been found on the input map file.

ERROR 202 TOO MANY ENTRIES FOR FMPS, RUN FMPS OFF-LINE

ERROR 203 DICTIONARY '************' NOT FOUND, NO TOPIC GENERATION BY DICTIONARY SYMBOL CONVERSION

Dictionary name on N-cards was not found, or dictionary implied by R-cards not found.

ERROR 204 REFERENCE TO MAP ************ NOT FOUND FOR THIS SECTOR, NO TOPIC GENERATION BY SYMBOL CONVERSION FOR THIS SECTOR

The reference topic defined on a K-card has not been found on the map-file and has not been created in this run.

ERROR 205 AGGREGATE AREA DICTIONARY '************' NOT FOUND, NO TOPIC GENERATION BY SYMBOL CONVERSION FOR THIS SECTOR

ERROR 207 NO CONVERSION SYMBOLS HAVE BEEN SPECIFIED FOR THE FOLLOWING SYMBOLS ON REFERENCE TOPIC ************

The K-card conversion symbols have not defined replacing characters for number of symbols found on the reference topic.

ERROR 208 THERE ARE COMBINATIONS OF MAP VALUES NOT SPECIFIED FOR SECTOR ***-*** (******)

Conditional expressions on R-cards are not sufficient to cover all possible combinations of values on factor maps. Use a final 'ELSE' clause to resolve.

ERROR 209 MASTER MAP ************ NOT FOUND FOR THIS SECTOR

A topic generation by external data uses a master map to find the area outlines, this map has not been found on the map file and not been created previously in this run.

ERROR 210 DICTIONARY ************ NOT FOUND, ELEMENT MAP IGNORED

A master-map name has been specified on a G-card but the appropriate dictionary which defined the 2-character area suffices for this master map has not been found on the map file nor been created in this run.

ERROR 211 NO AREA POINTERS FOUND IN DICTIONARY ************ FOR THIS SECTOR, ELEMENT MATRIX IGNORED

The dictionary with the same name as the element matrix does not contain any area pointers which point to this sector. Check section designation on the G-card or modify dictionary.

ERROR 212 NO AREA POINTERS HAVE BEEN FOUND IN THE DICTIONARY ************ FOR THE FOLLOWING AREA SYMBOLS

The dictionary with the same name as the element matrix does not contain area pointers for areas designated on the matrix. This message is followed by one or more errors 213.

ERROR 213 SYMBOL * IN ROW ** , COL. ***

Enter an area pointer for this symbol in the dictionary.

ERROR 214 MAP '************', SECTOR ROW ***, COLUMN ***
NOT FOUND

Map indicated on statistics cards was not found in the directory

ERROR 215 SCALE NOT FOUND, NO TOPIC GENERATION FOR ALL
SECTORS

A topic generation by external data needs a scale. No J-cards have been supplied nor has auto-scale been indicated.

ERROR 216 SCALE INCORRECT FOR THIS TOPIC, NO RANGE
PROVIDED FOR THE FOLLOWING VALUE

The scale defined for the topic to be generated by external data does not cover the whole range of incoming data. Change the scale to cover all data.

ERROR 217 THE FOLLOWING AREA POINTERS IN THE DICTIONARY
************ ARE INCORRECT FOR THIS SECTOR

The dictionary with the same name as the element matrix does contain pointers to areas in this sector which do not agree with the matrix area outlines. Check dictionary and matrix. This message is followed by one or more warnings 245.

ERROR 218 REFERENCE TOPIC ************ NOT FOUND, NO
TOPIC GENERATION BY COMPUTATIONS FOR
THIS SECTOR

A reference topic used in computations on R-cards has not been found on the map file nor been created in this run.

ERROR 219 DICTIONARY ************ NOT FOUND, NO DISPLAY
POSSIBLE

A dictionary to be displayed has neither been found on the map file nor been created in this run.

ERROR 220 DICTIONARY '************' NOT FOUND TO MAKE AGGREGATE

Dictionary referenced for statistics cards was not found in the directory.

ERROR 221 DICTIONARY ************ NOT FOUND TO GENERATE THE AGGREGATE AREA OVERLAY MAY ************

The aggregate area master map to be used as boundary overlay topic for display requires a basic area dictionary to be available. This dictionary has not been found on the map file and has not been created in this run.

ERROR 222 SECTOR NOT FOUND FOR DISPLAY

A topic sector to be displayed has not been found on the map file and not been created in this run.

ERROR 223 SECTOR ***-*** OF OVERLAY MAP ************ NOT FOUND

A boundary overlay map used indicated has not been found on the map file and not been created in this run.

ERROR 224 AGGREGATE AREA DICTIONARY ************* NOT FOUND, TO GENERATE AGGREGATE AREA MAP

The aggregate area master map requires an aggregate area dictionary, which has not been found on the map file and not been created in this run.

ERROR 225 AGGREGATE AREA DICTIONARY ************ NOT FOUND, TO GENERATE OVERLAY MAP ************

The aggregate area master map boundary overlay topic requires an aggregate area dictionary, which has not been found on the map file and not been created in this run.

ERROR 227 MASKING TOPIC ****** NOT FOUND, NO TOPIC GENERATION BY EXTERNAL DATA FOR THIS SECTOR

The masking topic specified was not located on the map file and therefore topic generation for the specified sector is impossible to complete. Check spelling of the masking topic and the latest dictionary listing.

ERROR 228 TOO FEW VALUES FOR DESIRED LEVEL OF NESTED MEANS

The number of unique values is less than the number of intervals or the distribution of data does not fit the number of levels specified. Select fewer intervals.

ERROR 229 ILLEGAL CHARACTERS IN RHS RELATION

ERROR 230 UPDATE FOR DICTIONARY INCORRECT

Modify transactions for a dictionary have been defined for areas which use area symbols, which have already been used for other areas. Use different symbols for different areas. This error message is followed by one or more errors 231.

ERROR 231 CODE '************' IN EXISTING DICTIONARY USES SYMBOL '***'. UPDATE FOR CODE '************' IGNORED

Submit another modify transaction using a new unique area symbol.

ERROR 232 MULTIVARIATE MAP '************' SECTOR *** ***, ROW ***, COL *** HAS ILLEGAL SYMBOL *

ERROR 233 TABLE OVERFLOW IN COMPUTING SYMBOL COUNT FOR MASTER MAP MULTIVARIATE TOPIC

Study area is too large, partition study area into smaller segments.

ERROR 234 SYMBOL COUNT TABLE HAS EXCEEDED 312 DIFFERENT MASTER MAP SYMBOLS, SIMPLIFY TO FEWER AREAS

ERROR 235 ILLEGAL SYMBOL IN MAP '************' SECTOR *** ***, THE SYMBOL WAS *

ERROR 236 SYMBOL *** WAS NOT FOUND IN TEMPORARY DICTIONARY

ERROR 237 SECTOR LINK ERROR FOR SYMBOL ***

ERROR 238 DUPLICATE SECTOR ENTRIES ENDED UP EQUAL TO ***

ERROR 239 EXTERNAL DATA FILE IN ERROR

Either incorrect file has been mounted, or data does not conform to E-card specifications or there are hardware problems.

ERROR 240 THERE ARE TOO MANY VARIABLES IN THE LP MODEL

There were greater than 1740 items in the LP matrix, use FMPS as the LP model and run offline.

ERROR 241 MULTIVARIATE MAP '************' SECTOR ROW *** COLUMN ***, NOT FOUND

The map specified as the multivariate topic on 'T' cards was not in the directory.

WARNING 242 NO VALUES HAVE BEEN FOUND FOR THE FOLLOWING SYMBOLS ON REFERENCE TOPIC ************

During generation of a topic map, the areas of the reference topic listed received no input values and therefore it was impossible to create output for these areas. Check the input data file.

ERROR 243 INSUFFICIENT SPACE ON FILE A$A

Resubmit job with fewer transactions or explicitly assign (@ASG,T A$A., F///n) where 'n' is some number greater than 1ØØØ. 1ØØØ is the default value used by RAP.

ERROR 244 SEGMENTS MISSING IN POLYGON '******'

There is an error on the census "DIMECO" file in that a polygon is not completely digitized.

WARNING 245 POINTER FOR SYMBOL ***, ROW ***, COLUMN ***, WHERE SYMBOL *** HAS BEEN FOUND

Check these areas in the dictionary and in the element matrix.

ERROR 246 INSUFFICIENT CORE SPACE FOR POLYGON BOUNDARY

Partition map into subsets with fewer sectors.

ERROR 247 TITLE AND SCALE RECORD WAS NOT FOUND

The title and scale were requested but no title and scale by the name mentioned was found in the dictionary.

ERROR 248 NUMBER OF ENTRIES ON E-CARDS DOES NOT MATCH NUMBER OF DATA ITEMS IN FILE

An error was discovered when processing the external data file, indicating there was either too much data or too little. Compare the data file with the entries on the E-cards. There should be a one-to-one correspondence.

ERROR 249 NUMBER PF VERTICES IN POLYGON IS TOO LARGE

RAP has a limited amount of storage to contain all the vertices of a polygon, and the user has exceeded that limit. Run a thinning program to remove some of the points from the polygon or divide the polygon into smaller polygons which can be processed separately.

WARNINGS - NEW MAP FILE GENERATION PHASE

WARNING 301 'CREATE' SPECIFIED FOR GRID *** TOPIC ************
SECTOR ROW *** COLUMN ***, BUT TOPIC EXISTS
ALREADY, NO ACTION TAKEN

Self explanatory.

WARNING 302 'CREATE' SPECIFIED FOR GRID *** TITLE ************,
BUT TITLE EXISTS ALREADY, NO ACTION TAKEN

Self explanatory.

WARNING 303 'CREATE' SPECIFIED FOR GRID *** DICTIONARY ************,
BUT DICTIONARY EXISTS ALREADY, NO ACTION TAKEN

Self explanatory.

WARNING 304 'MODIFY' OR DELETE' SPECIFIED FOR GRID *** TOPIC
************ SECTOR ROW *** COLUMN ***, BUT
TOPIC DOES NOT EXIST, NO ACTION TAKEN

Self explanatory.

WARNING 305 'MODIFY' OR 'DELETE' SPECIFIED FOR GRID *** TITLE
************, BUT TITLE DOES NOT EXIST, NO
ACTION TAKEN

Self explanatory.

WARNING 306 'MODIFY' OR 'DELETE' SPECIFIED FOR GRID ***
DICTIONARY ************, BUT DICTIONARY DOES
NOT EXIST, NO ACTION TAKEN

Self explanatory.

WARNING 307 SUBSET TAPE SPECIFIED FOR GRID ***, TOPIC'************',
SECTOR ROW ***, COLUMN ***, BUT TOPIC DOES
NOT EXIST. NO ACTION TAKEN

WARNING 308 SUBSET TAPE SPECIFIED FOR TITLE '************' BUT
TITLE DOES NOT EXIST. NO ACTION TAKEN

WARNING 309 SUBSET TAPE SPECIFIED FOR DICTIONARY '************'
BUT DICTIONARY DOES NOT EXIST. NO ACTION
TAKEN

RUN STOP 401 DRUM WRITE ERROR, STATUS =***

Resubmit the run.

RUN STOP 402 DRUM READ ERROR, STATUS =***

Resubmit the run.

RUN STOP 403 TAPE WRITE ERROR ON UNIT **, STATUS =***

Resubmit the run, if error occurs again, use another output tape on the defined unit.

RUN STOP 404 TAPE READ ERROR ON UNIT **, STATUS =***

Resubmit the run. If error occurs again repeat the previous run in the map file cycle (if the unit is unit 7).

RUN STOP 405 TABLE OVERFLOW, TOO MANY TRANSACTIONS

Too many sectors and topics have been referenced and/or generated.

RUN STOP 406 TABLE OVERFLOW, TOO MANY SORT ENTRIES
RESUBMIT THIS BATCH IN 2 OR MORE SEPARATE DECKS

Too many sectors and topics have been referenced and/or generated.

RUN STOP 407 PARAMETER TABLE OVERFLOW, RESUBMIT THIS BATCH IN 2 OR MORE SEPARATE DECKS

Too many symbol conversions have been specified.

RUN STOP 408 REQUESTER TABLE OVERFLOW, TOO MANY A-CARDS
RESUBMIT THIS BATCH IN 2 OR MORE SEPARATE DECKS

A maximum of 20 'A' cards may be submitted in one runstream

RUN STOP 409 SECTOR READ OR SECTOR WRITE ERROR

RUN STOP 410 INOUT ERROR, SEE STATUS CODE

RUN STOP 411 PROGRAM ERROR IN GENERATION BY POINTS/LINES.

RUN STOP 412 INCONSISTENCY IN STEPWISE REGRESSION ANALYSIS

RUN STOP 413 UNKNOWN ERROR TYPE

APPENDIX C

GLOSSARY

A -- AGGREGATE - A collection of topic elements by symbol or area.

ALGORITHM - A prescribed set of well defined rules or process for the solution of a problem. Algorithms are implemented on a computer by a programed sequence of instructions.

ALPHA MAP - A map output represented by alphanumeric characters.

ALPHANUMERIC - The characters which include letters of the alphabet, numbers and other symbols such as punctuation or math symbols.

ACTIVE MODE - The process of making actual changes to a map file in the GRID system.

ACTIVE PARTICIPATION - See Active Mode.

ANNOTATE - The marking of features on a map or photograph for the purpose of clarification using letters, numbers and symbols.

ARC - A part of a mathematically defined curve, such as part of a polygon.

AREAL (INFORMATION, FEATURE, STATISTICS) - Pertains to a such as vegetation, soils, etc., whic enclosed by a boundary of any polygo

AREA POINTER - Indicates which geographic map that is being defined (geographic).

ARITHMETIC - Computation or problem solving involving real numbers and the arithmetic operations.

ARRAY - The arrangement of a sequence of items according to their values, such as from largest to smallest.

ATTRIBUTE - A quality, characteristic or object which serves to describe, classify or identify something. Quantitative data associated with polygons, arcs, or points.

B -- BATCH PROCESSING - A technique by which similar input items are grouped for processing during the same machine run.

BOOLEAN EXPRESSION - An algebraic process formulated by George Boole. Similar to ordinary algebra but with classes, propositions, etc., for variables rather than data values. It includes operators such as AND, OR, NOT, IF, etc.

BOUNDARY MAP - Contains the boundaries separating homogeneous areas within the parent map, i.e., soil boundaries from soil type maps.

C -- CALCOMP - A trade name of California Computer Products, Inc., Anaheim, California, manufacturers of digital graphic systems used for plotting.

CARD - Paperboard material formed in uniform size and shape which is punched in various arrays to be sensed electronically by a card reader. Standard card is 7 3/8 X 3 1/4 inches and contains 80 columns.

CARTESIAN COORDINATES - Values representing the location of a point in a plane in relation to two perpendicular intersecting straight lines, called axes. The point is located by measuring its distance from each axis along a parallel to the other axis.

CELL - The storage for one unit of information, usually one character, i.e., soil type A.

CELLULAR MAP - A display of input cell data by single characters for each cell.

CHARACTER - One symbol of a set of elementary symbols such as those corresponding to the keys on a typewriter. See Alphanumeric.

CODING, CODED - A system of symbols representing cell data for input to a computer.

COMPLEX POLYGON - A polygon which has an exterior boundary and one or more interior boundaries. Area within interior boundary is called a DONUT or hole in the polygon.

COMPOSITE - The bringing together of pieces to obtain a whole, i.e., selected data from two or maps, each of which shows the distribution of individual resources or topics necessary for a solution to a problem.

COMPOSITE MAP - A map which results from overlaying two or more layers of the same area.

COMPUTER - A device capable of accepting information, applying prescribed processes to the information, and supplying the results of these processes.

CONDITIONAL EXPRESSION - An expression which has a particular characteristic, which when taken as a whole, it may be either true or false in accordance with the rules. See Appendix A, Input Form, R-Card.

CONFORMAL MAP - A map where the basic geographic shape conforms to some previously defined boundaries such as counties or regions.

CONNECTIVES - In Boolean algebra, it is that specific symbol (NOT, AND, OR) which signifies the operation to be performed.

CONTIGUOUS - Adjacent or adjoining.

CONTINUOUS MAP - Shows variations from element to element of data for topics such as soil types, land use, etc.

CONTINUOUS MODE DIGITIZING - See Digitize.

CONTOUR MAP - A topographic map which portrays relief by the use of contour lines.

COORDINATE - One of a set of numbers used to determine the location of a point on a given plane or system. Linear or angular quantities which designate the position of a point in a given reference or grid system. Also used as a general term to designate the particular kind of reference frame or system such as plane rectangular coordinates.

COORDINATE TRANSFORMATION - A mathematical process of obtaining a modified set of coordinates by rotating the coordinate axes from their point of origin.

CREATE - An "A" Card transaction used when any new map, dictionary or title is to be added to the Map File.

CURSOR - The mechanical or electromechanical tracking device or pointer on the digitizing table, sometimes referred to as a stylus.

CURVILINEAR COORDINATES - Any linear coordinates which are not cartesian coordinates.

CURVILINEAR LINES - Pertains to curved lines, as in curvilinear coordinates.

D -- DATA BASE - A set of data or information on which operations can be performed and conclusions can be based.

DATA FILE - A collection of data sets that has been stored on some computer compatible medium.

DELETE - An "A" Card transaction used to destroy an entire dictionary, map or title on a map file.

DEMAND PROCESS - The processing of data as quickly as it becomes available or ready. This is real-time and thus avoids the need for storage of any appreciable amount of unprocessed data.

DIAGNOSTIC - Pertaining to the detection, discovery and further isolation of a malfunction or a mistake.

DICTIONARY - A map dictionary is a table which relates shapes defined by a master map the area. See Appendix A. Inn

DIGITAL - Term used loosely to refer to equipment, techniques and data involved in the digitizing process.

DIGITIZE - The process which converts information, generally graphic or pictoral, into computer recognizable characters which are locatable in some coordinate system. The recording of data by indicating a point coordinate on a data processing medium (e.g., card type).

DIGITIZE CONTINUOUS MODE - The process of recording points at a pre-set increment or determined by the operator.

DIGITIZE POINT MODE - The process of recording individual points as selected by the operator.

DONUT "HOLE" - A polygon or polygons contained within the exterior boundary of a complex polygon.

DOUBLE TRACE - The process of digitizing polygons separate of each other resulting in a double line for common polygon boundaries.

DOUBLE LINE DIGITIZING - See Double Trace.

E -- ELEMENT - An element of a map corresponds to one grid position within a sector.

EQUIDISTANT - Being the same distance from some given object.

EQUIDISTANT MAP - Generated by mathematical equation displaying areas which are constructed using an imaginary line equidistant from each pair of adjacent points (i.e., topics such as income and crop production).

EXTERNAL DATA FILE - A data file which is not defined in the GRID system.

EXTRACT - To copy from a set of items all those items which meet a specific criterion, (e.g., user creates a new polygon or grid files which are subsets of existing files).

F -- FIDUCIAL POINT - A point used as a basis of reference.

FIDUCIAL COORDINATE - See Fiducial Point.

FILE - A collection of related records treated as a unit.

FLOW CHART - A system analysis tool that provides a graphical presentation of a procedure.

FMPS - Functional Mathematical Programing System. A UNIVAC library used for the processing of mathematical problems.

FREQUENCY POLYGON - A plot or statistical summary showing the frequency of occurence of each type of element symbol.

FUNCTION - A specific purpose of an entity or its characteristic action.

G -- GEOGRAPHIC - Signifying basic relationship to the earth considered as a globe-shaped body.

GEOGRAPHIC COORDINATE - The position of a point on the surface of the earth expressed in terms of latitude and longitude.

GEOGRAPHIC COORDINATE SYSTEM - A coordinate system that is referenced to points of latitude and longitude.

GEOGRAPHIC POSITION - See Geographic Coordinate.

GEOGRAPHIC WINDOW - An area represented by user selected geographic coordinates.

GRAPHIC DISPLAY - A physical or pictoral representation of data, such as printing, plotting output.

GREY TONE - A method of displaying a map that contains numeric characters. The output will yield a display with the same shape as the numeric values but with symbols whose intensity is proportional to its numeric value.

GREY SCALE - See Grey Tone.

GRID - A pattern of horizontal and vertical lines which form a system of blocks used as a reference system or graphic or photographs. See Grid Cell Method.

GRID CELL METHOD - A pattern of horizontal and vertical lines which forms a system of blocks. The blocks are used to determine area locations and amounts for resource management. See Grid.

GRID CODE - In the GRID system it is a numeric means of seperating the various maps, depending on the amount of area covered.

H -- HANDCODE - A manual procedure for recording cell data using a grid overlayed onto a map.

HEADER RECORD - A record which contains information identify types and characteristics about the data in the records that follow.

HIGH SPEED PRINTER - A printer that operates at a speed more compatible with the speed of computation and data processing so that it may operate on line.

I -- IDENTIFIER - A symbol whose purpose is to identify, as to indicate or name a body of data. A key.

INPUT - Information or data transferred or to be transferred from an external storage medium into the internal storage of the computer. Data to be processed.

INTEGER - Any positive or negative counting number or zero.

INTERACTIVE MODE - Reciprocal action between two entities such as terminal and computer. See Demand Process.

INTERSECTION - The procedure of overlaying two or more layers of information in order to satisfy a user inputted request. The intersection of two sets is the set consisting of all elements common to both of the two sets. (e.g., soil type A with timber type M)

INTERFACE - A common boundary (e.g., the boundary between two systems or devices).

K -- KEYPUNCH - A special device to record information on cards by punching holes in the cards to represent letters, digits and special characters.

L -- LABEL - A unique identification of individual

LATITUDE - A linear or angular distan
the equator on a sphere or
90 degrees.

LAYER - A single topic of information. Also a map or overlay that contains information about an area that is distinct from other information. (e.g., tree type, soil type, etc.)

LEFT JUSTIFIED - Data is left justified when the left hand digit or character occupies the left hand position of the space alloted for that data.

LEFT ADJUSTED - See Left Justified.

LINEAR COMBINATION - A compositing method achieved by assigning a weighting coefficient per topic for data manipulation.

LINE PRINTER - A printer in which an entire line of characters is composed and determined within the device prior to printing.

LITERAL - A word or number which names or describes itself and remains unaltered during the operation of the program.

LOCAL COORDINATE SYSTEM - A coordinate system that references itself and is not necessarily geographically oriented (e.g., the X, Y coordinate system of the digitizing table.)

LONGITUDE - A linear or angular distance measured East or West from a reference meridian (usually Greenwich England) on a sphere or spheroid, and measured through 180 degrees.

M -- MANIPULATE - The performance of those data processing chores common to most users, such as sorting, input/output operations, and report generation.

MAP DICTIONARY - See Dictionary.

MAP LAYER - See Layer.

MAP SECTOR - See Sector.

MASTER GRID - An original grid normally produced on a stable base medium such as mylar used for preparing duplicate copies for user needs.

MASTER MAP - Are alpha maps which have a dictionary associated with them. Used primarily for the purpose of storing geographic shapes such as county boundary, state boundaries, etc.

MATH MODEL - A mathematical representation of a process, device or concept.

MERGER - An "A" Card transaction used to combine existing dictionaries, maps, or titles from one map file to another.

MINICOMPUTER - A small computer which in its basic configuration has at least 4096 words of memory, employing words between 8 and 16 bits in length.

MODAL - Of or pertaining to a statistical mode; most frequent, common or typical.

MODIFY - An "A" Card transaction used to add new entries to a dictionary or to change current entries in an existing dictionary, map or title on the map file.

MONITOR - To control the operation of several
machine runs so that the compute
advantageously. In the "A" Card
the map file indicates that t
affected, only "monito

MULTIVARIATE FREQUENCY - See Multivariate Histogram.

MULTIVARIATE HISTOGRAM - Provides cross tabulation of two topics displaying the frequency of occurence of each symbol.

MULTIPLE LINEAR REGRESSION - Produces a regression analysis of independent maps indicated on "V" Cards explaining the dependent map topic on t "T" Card.

MYLAR - Trademark of Dupont for a stable base polyester film.

MAP JOINING - The process of matching map sheets that have a common edge.

N -- NESTED MEANS - A family of sets where, given any two of its sets, one is contained in the other.

NONCONTIGUOUS - Not adjacent or adjoining, areas that are physically separated.

NUMERIC CHARACTER - Composed of numerals, the value of a number as opposed or contrasted to character representatio

NUMERIC OUTPUT - A printer output represented by numeric characters.

O -- OFF-LINE PROGRAM - Operations performed by auxiliary computer equipment independent of the computer mainframe.

OPEN-ENDED - Having the capability of being extended or expanded.

OPERATOR - The what-to-do portion of an operation.

OPTIMIZATION - The maximizing or minimizing of a given function subject to some type of constraint (s).

OVERLAY - A printing or drawing that shows detail not appearing, or requiring special emphasis, on the original map.

OVERLAYING - The process of compositing (superimposing) one layer of information with another to obtain an overlay of common areas.

P -- PARAMETER - A definable characteristic of an item, device, or system.

PASSIVE MODE - See Passive Participation.

PASSIVE PARTICIPATION - Indicates that the map file is not physically affected, only monitored. See Monitor.

POINT MODE - A method of digitizing; the digitizer is set to produce a discrete point after location of the cursor. This method is used to locate discrete points of long, straight line segments.

PLOT - To map or diagram.

POLYGON - A closed plane figure bounded by three or more line segments.

Q -- QUAD - Abbreviated form for quadrangle.

QUADRANGLE - A rectangular, or nearly so, area covered by a map, usually bounded by given meridians of longitude and parallels of latitude, usually 7 1/2 or 15 minutes apart.

QUALIFIER - A name that is associated with another name to give information about the latter and distinguish it from other things that have the same name.

REAL-VALUED MAP - Allows for continuous quantitative information to be stored. Real values must be transformed to either a numeric or alpha map for display purposes.

REGISTRATION POINT - A discrete point where the local coordinates as well as the latitude and longitude are known. It serves as the basis of conversion between coordinate systems.

RELATIONAL OPERATORS - An expression that describes a relationship between two terms; (e.g., A is less than B.).

REMOTE TERMINAL - An input/output unit, or other piece of equipment which is removed from the computer center but connected by a communication line.

REMOVE - An "A" Card transaction used to erase entries on an existing dictionary on the Map File.

RESOURCE DISPLAY - Computer assisted analysis, storage, retrieval, and spatial display of resource information from existing maps, photographs and other sources.

RESOURCE OVERLAY - See Overlay.

RETRIEVE - To find and select specific information.

RIGHT JUSTIFY - Data is right justified when the right hand digit or character occupies the right hand position of the space allocated for that data.

ROUTINE - A sequence of instructions that carry out a well defined function.

RUNSTREAM - A series of requested computer commands used to execute a program.

S -- SCALE - The ratio of a distance on a photograph, map or other graphic to its corresponding distance on the ground, or to another graphic.

SECTOR - A sector is a geographic sized unit within the GRID system represented by 120 rows x 120 columns containing 14400 cells.

SHEET CORNER - The corners that bound the body of a map, usually latitude and longitude.

SOFTWARE - Programming aids that are frequently supplied by manufacturers to facilitate the users efficient operation of the equipment, such as assemblers, computers, subroutine libraries, operating systems, etc.

SOURCE MAP - The map used for the selection of map detail to prepare resource overlays.

SPATIAL - Of or pertaining to space; occupying space.

STATISTICS - A discipline dealing with methods of obtaining data, analyzing and summarizing it, and drawing inferences from data samples by the use of probability theory.

STEPWISE MULTIPLE REGRESSION - Provides a regression of maps indicated on "U" Card as independent topics to the map referenced on this card.

STORE - To retain data in a device from which it can be obtained a later date.

SUPPRESS - An optional function in either off-line or on-line printing devices that permits them to ignore certain input characters or a group of characters.

T -- TOLERANCE - A permissible deviation from a specified value, expressed in actual values or more often as a percentage of these nominal values.

TOPIC - The subject title of a map file.

TRANSACTION - A general description of updating data relevant any item.

U -- UNBLOCKING - The process of separating and obtaining one or more records from a block in the memory.

USER ORIENTED - Increases the accessibility of computers to non-programming problem solvers.

UTM COORDINATE - Universal Transverse Mercator Coordinates. Quantities which designate the location of a point on the UTM Grid.

UTM GRID - A grid system based on the Universal Transverse Mercator Projection applied to maps of the earth's surface extended to 84° North and 80° South latitude.

V -- VARIABLE - A data item, or specific area in memory, that can assume any of a set of values.

W -- WEIGHTING - The process of assigning values to data so that some data is more heavily valued than others.

WINDOW DISPLAY - A display representing a user specified area one sector.

X -- X-COORDINATE - Defines the location of a point in a horizontal plane and in an east-west direction from the origin.

X-AXIS - A horizontal axis in a system of rectangular coordinates.

X-DIRECTION - See X-Coordinate.

X-WIDTH - See X-Coordinate.

Y -- Y-COORDINATE - Defines the location of a point in a horizontal plane and in a north-south direction from the origin.

Y-AXIS - A vertical axis in a system of rectangular coordinates.

Y-DIRECTION - See Y-Coordinate.

Y-WIDTH - See Y-Coordinate.

Z -- Z-COORDINATE - Defines the location of a point perpendicular to the plane which contains the X and Y Axes. (Commonly referred to as an elevation.)